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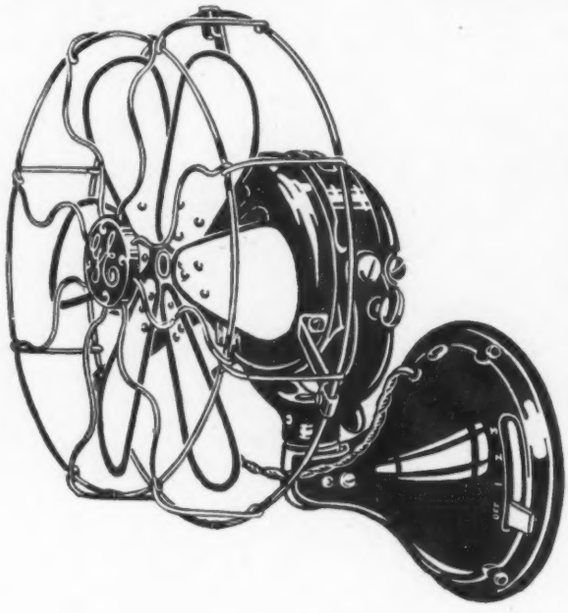

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RAIL AND STEAMSHIP TERMINAL FREIGHT HANDLING

BY W. D. PEASLEE.

(In this article the author analyzes the freight handling situation in a comprehensive manner and gives much valuable information which he has gathered for the groundwork of a proposed solution of this problem which is also carefully worked out and completely stated.—The Editors.)

From Car to Hoppers Without Manual Labor.

The growth, extent and complexity of civilization has laid greater and greater burdens on our industries, but perhaps the heaviest falls upon transportation. Cheap and rapid transportation is the index of the advance of civilization and progress for any region. The response of the men engaged in this work has been magnificent. Transcontinental railroads have been built and rebuilt almost at once; millions have been spent to save a few per cent grade and to provide heavier rails and equipment. The brains and faith of engineers and capitalists have been pitted against the forces of nature until today the cost of transporting freight by ocean is about one mill per ton, and by rail is from 2.8 to 8 mills per

ton mile. This low transportation cost has been attained by the substitution of mechanical power for man power wherever possible.

Labor in Freight Handling Comparatively High.

With this increase in economy and efficiency of the transportation systems there is one link in the chain that is practically the same as it was fifty years ago, and now represents the greatest unit tax the consumer pays for the privilege of transportation. This is the handling of freight at rail and steamship

Storage Battery Motor Truck for Freight Handling.

terminals. Here freight that has been brought across the ocean at a cost of about one mill per ton mile is handled at a labor cost varying with the kind and condition of the freight and the local terminal conditions from $.10 per ton per 100 ft. ($5.28 per ton mile) to $.70 per ton per 100 ft. ($36.96 per ton mile), by means of stevedores with hand trucks, and the steam hoists and elevators of the ship. This cost has been increasing steadily due to the increasing cost of labor and the increasing congestion of terminals which renders the worker less efficient.

The cost of re-handling miscellaneous freight by manual labor with hand trucks, varies with the local conditions from $.35 to $.95 per ton with efficient management. As all transportation problems involve at least two terminal handlings and some three or more it will be seen at once that in the average transportation the cost of handling at terminals is roughly as great as the cost of carrying it by ocean 1200 miles or by rail 400 miles.

An attempt has been made to meet the tonnage and speed requirements of the transportation systems of today by using the methods of fifty years ago on a larger scale, but the fact that there is a limit to the number of men that can work efficiently in a given space has resulted in confusion and inefficiency with its attendant excessive cost.

Tonnage Handled at Terminals.

Fifty years ago the handling of 150 tons per day at a terminal was considered a high mark while today a railway freight house in a city of 100,000 inhabitants must handle 250 to 300 tons of miscellaneous freight per day. This will be done at a cost of about $.40 per ton for labor, varying slightly with local conditions and wages paid, by means of common labor with hand trucks. The larger terminals now handle 2000 tons per day by the same method and would like to handle 6000 tons per day.

To bring terminal operations to the degree of efficiency enjoyed by the transportation systems a sweeping reorganization must be undertaken, and a part of the millions that now go into securing a fraction of a cent per ton decrease in transportation cost must be devoted to the reduction of terminal handling costs by the same method that has proved so successful in reducing costs in all modern industries, the displacing of human effort at every possible point by mechanical force and apparatus.

The Problem Analyzed.

It will be interesting to analyze the requirements of the terminal problem and to establish the main features of an ideal freight handling equipment.

The fundamental requirements of an ideal freight terminal are:

(1) A cost of handling commensurate with the present cost of hauling.

(2) Dispatch to meet the advance in speed of the hauling of increasing freight.

(3) Safety to goods handled.

The particular system that will best meet these requirements will vary with the local conditions of every terminal and can be determined only by a detail analysis of each case. In designing a terminal freight handling system some means must be available by which systems operating under different conditions and using different equipments may be compared, and their relative efficiencies established.

The four operating essentials of a perfect mechanical freight handling system are:

(1) Every foot of space in the cars, ships and terminals must be covered by the machinery.

(2) There must be a minimum freight moving by manual effort.

(3) All kinds and conditions of freight must be safely and quickly handled with equal ease.

(4) It must maintain a continuous uniform working rate, under effective and instant control.

Such an installation would handle freight with maximum dispatch and safety and least human effort but would entail enormous first cost and the operating cost, fixed charges included, would be unreasonably high. However the study of such a system is useful in that it provides a basis upon which different systems may be compared. Obviously we can never have a perfect system but comparisons may be made by investigating the deviations from the ideal met with in any particular installations.

The first requirement, while possible mechanically, is never at the present time realized on account of the first cost entailed, and a balance must be struck between the capitalized saving that will be secured with a proposed installation and the cost of the equipment necessary to secure it.

The second requirement, it is safe to say, is never satisfactorily attained. Loaders and unloaders for the freight handling machinery must be provided even if their only function is to handle slings. There are certain processes such as handling iron with magnet cranes, wherein this condition is attained but this class of freight is rarely met with in the operation of a freight terminal to any continuous degree. Checkers also are required and in many cases where the expense of replacing existing beam scales with auto-

matic scales is not justified, weighers will be required.

The third requirement may be met to a considerable degree but some kinds and conditions of freight will always handle more easily and rapidly than others from the inherent conditions of the packages. With a well designed system however this condition will be met to a remarkable degree.

The fourth condition may be met almost perfectly by careful design and operation of the system.

The points in which any system will depart from the ideal in order of their departure are:

First, that there must be a minimum of freight moving by manual effort.

Second, that the machinery must serve all the space in the cars, ships and terminal.

Third, that all sorts and conditions of freight must be handled with equal ease, dispatch and safety.

A discussion of these departures and a determination of their probable degree for different systems will give a means of comparing such systems on an equitable basis.

The Entirely Manual Method.

Probably the most complete departure from the ideal is the practice met with in Asiatic and other non-progressive countries of handling freight entirely by manual effort. From this condition successive stages are passed of adaption of mechanical aids, moving goods on inclined planes and rollers, with block and tackle, etc., until we find the popular method that has been employed for the last fifty years or more, the employment of an army of stevedores with hand trucks aided by a couple of steam winches and elevators.

As this system is the one most commonly met with, an analysis will be made of the labor necessary to move freight by this method and the probable savings that may be expected will be determined. The labor required to move freight by this method falls into five divisions.

(1) Loading trucks at the starting point.
(2) Weighing, checking and marking.
(3) Transportation on hand trucks.
(4) Unloading trucks at destination.
(5) Superintendence.

Time studies of the operations of different terminals in the United States have shown that the proportion of these divisions are about as shown in Fig. 1, for hand loading, unloading, trucking, and piling, supplemented in the case of steamship terminals by the hoists and elevators of the ships. The loading and unloading operations are not separated as the force in the cars or ship is limited by the space available and is practically constant whether loading or unloading the trucks.

By a properly designed system the trucking labor may be eliminated entirely but in some cases it will be at the expense of an increase in the loading and unloading force. It is at this point that a balance must be struck between the first cost of a system that will cover all the space, pile the freight and pick it up with the minimum labor attendance and the capitalized cost of doing part of this work by manual labor. With no provision for mechanical loading, unloading or piling this cost may be increased over that shown in Fig. 1 to about 40 per cent while with complete telepherage systems it will be reduced to about 10 per cent.

Efficiency in Weighing.

In weighing, checking and marking the only saving is found in the use of automatic scales in place of the ordinary beam scales. It has been found that it requires an average of 10 sec. to weigh a truck load of freight on automatic scales and 30 sec. to weigh it on ordinary scales. The main advantage secured by this change is in the increased rapidity of handling possible. The saving in labor will be the elimination

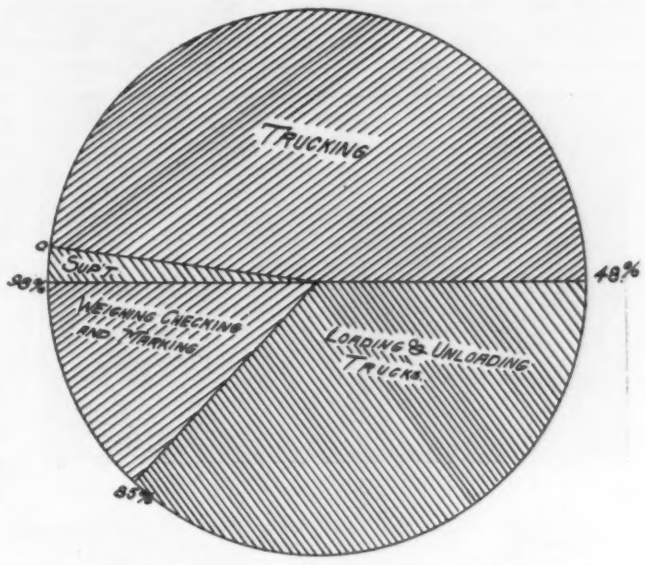

Fig. 1. Showing Division of Labor Costs in Average Terminal. Manual Trucking and Handling.

of a few weighers, amounting to about 1 per cent, but the gain in rapidity of operation and ability to maintain the higher rate of work will prove a potent factor in attaining the fourth requirement of a perfect system. The superintendence item remains the same for almost any system.

Then with the labor cost of the system represented in Fig. 1 as 100 per cent we may with a maximum investment, expect to reduce the labor cost to about 24 per cent, using a very complete transportation and mechanical piling system. With a smaller investment this labor cost will increase until with manual loading, unloading and piling, and mechanical transportation we find a labor charge running up to about 55 per cent.

To these labor charges must then be added:

The operation cost of the mechanical system, including operators, power, maintenance and interest on the investment.

Depreciation.

Taxes and insurance on the equipment.

This result will then be the handling cost upon which basis different systems may be compared.

It might be considered better to use the fundamental system wherein the handling is done entirely by manual effort as a basis but it seems more logical to use the most common and familiar system now met with, the one taken.

Equipment Available for Mechanical Method.

The standard apparatus on the market today available for building up a freight handling system is quite complete, as the following list shows, though

occasionally conditions will be found warranting the development of special apparatus, such as that shown for unloading sand, etc., and for coal, the photographs of which were furnished by the courtesy of Meese & Gottfried.

Equipment available for mechanical freight handling systems:

Portable Devices—

Slides, (Straight, spiral tubes, pipes, runs and chutes). Roller conveyors. Tractor chains, for helping trucks up steep inclines. April conveyors of wood or metal. Pumps. Scraper and bucket conveyors. Smooth belt conveyors. Hand trucks. Industrial trucks, storage battery and gas, with or without cranes. Auto trucks, gas, steam, electric and gas-electric. "Lowerators" and escalators. Stackers and "revolvators." Winches, steam, gas or electric, and portable cranes. Various special devices, car loaders and dumpers, etc.

Portable Unloader—Coal Car to Wagon.

Devices Usually Built Into and Made Part of the Terminal Building—

Gravity slides. Spiral conveyors. Blowers. Oscillating conveyors. Telepher or monorail systems. Storage battery locomotives and trailers and trackless trolleys. Cable car systems. Cranes (locomotive, driven by gas, steam, or electricity, Girder, Gantry, Pillar, Hammer head, Portal, Trolley bridges and various combinations of these types.) Elevators, steam, gas and electric. Ramps. Single and multiple drum winches.

In general two classes of terminal problems will be met with infinite variety in each. In one case the freight handling equipment is designed as a part of a new terminal building before construction and the architectural and freight handling features may be designed as a unit. In such cases the selection may be made on the basis of the most suitable machinery unaffected by structural limitations of the building.

In the other case the condition most met with at present, the terminal building is already in place and any material changes will entail considerable capital outlay. In this case the closest analysis is required and a compromise between efficiency of the freight handling equipment and first cost is the result. Fortunately even under these conditions actual installations show that a saving in handling costs of 20 to 40 per cent may be realized and that this saving represents a return on the necessary investment of from 40 to 250 per cent per annum according to the particular conditions met.

It will be seen at once that handling devices of the more portable type lend themselves most readily to an installation of this type as built-in equipment entails too much reconstruction of the existing buildings. To show the possibilities of a mechanical freight handling system installed in an existing building over the manual loading, unloading, trucking, and piling system the study of a particular case will be outlined.

[To be continued.]

OIL SWITCHES AND CIRCUIT BREAKERS.

BY FORD W. HARRIS.

(Out of a wide experience the author discusses the requirements of oil switches and circuit breakers and also analyses the causes of failure which are fully stated.—The Editors.)

Considering the large number in operation, the large amounts of money invested therein, their nearly universal distribution, and the many types manufactured, it is somewhat surprising that there has not been more written on the theory of the oil switch and circuit breaker. This is partly due to the fact that their manufacture has been restricted to a few companies, but more so that the engineers who were closest to the problem were not in agreement as to the theory or indeed as to the facts on which any such theory could be based. It is only quite recently that the oscillograph has been applied to the study of such problems and without some such instrument only a very elemental knowledge of the problem was possible.

A considerable amount of experimental data has been collected and it is now possible to speak with some authority on the subject. This knowledge is fairly widely distributed and I will therefore only attempt to point out in a general way the facts as I know them, and the inferences that I personally draw from such facts. These facts are the result of several years experience on this work and have been obtained from a large number of different tests at widely separated points both in space and time. They have ranged from what might be termed laboratory experiments involving small switches on moderate voltages to tests on some of the largest power houses in the country at currents and voltages that approach the limit even for this country. In addition to actual tests there is a large record of failures of oil breakers to draw on and scarcely an operating man in charge of large power plants but has had some such experiences.

The problem of opening the circuit promptly and quietly has grown with the size of stations. It is now and has always been easy to open shorts on stations of 5000 kw. and below and even stations of twice this capacity, with favorable conditions in other respects, are operating satisfactorily today with more or less obsolete breaking equipment. When, however, much larger stock of power began to be tied to lines of low impedance the problem became a serious one. The coming of the modern low impedance steam turbine with its large stored energy further aggravated the problem.

Heavy shorts are of rare occurrence on well designed and erected systems and it took a large number of cases extending over a considerable period of time to arouse the big operators and manufacturers to the gravity of the problem. The few cases that occurred previous to 1907 were assumed to be the fault of poor operation or accident and the big operators themselves shared this view with but few exceptions. The oil switch operates so quietly on moderate overloads that it had built up for itself a good reputation and those responsible for it felt it to be a satisfactory device. Further it was as good as they knew how to build it and therefore stood pat

for a much longer period than the gravity of the case should have permitted.

The results of this delay are no secret and the large manufacturers are today fully alive to the importance of the problem. There can be no question that they are all in a position today to handle heavy switching problems efficiently and this paper is not intended to in any way imply that such is not the case. It is simply a recapitulation and a restatement of facts that are well known to a few and which should be generally understood by the profession.

The earliest indication of strain that oil switches showed was a tendency to throw oil. This is an old symptom of trouble and has never been regarded with alarm so long as there were no other and more serious complications attending it. It has been the practice in some stations for many years to examine and, to some extent, repair the main switches whenever they were called upon to open heavy shorts. This involved extra switches and some expense but such shorts were of so rare occurrence that this did not impose a very great tax on the station, and operators were willing to do it although some of them "growled" a little. This throwing of oil was the first indication that the switches were under a strain that they could not satisfactorily meet, and indicated that as stations increased in size something would have to be done.

If you will examine the published material relating to the pioneer work on the single-phase railway system you will see that there is frequent reference to switch trouble and it is therefore violating no confidence to say that there was a considerable amount of such trouble in the early days. The able work done by the officials of the N. Y., N. H. & H. R. R., and particularly of Mr. Murray in conjunction with the engineers of the manufacturing company involved, have made ancient history of these troubles. That railroad is now running so successfully that any such mention is in the nature of a compliment on the efficiency of all parties concerned.

That system, as originally installed, consisted of an 11,000 volt station connected directly to an extensive overhead construction that was somewhat experimental and which proved to be somewhat low in its factor of safety. On a pioneer installation, of its class, this could be expected. The overhead was supported by steel bridges and beneath it there was a heavy traffic not only of electric rolling stock but of steam locomotives as well. The other side of the system was solidly grounded and there was but little impedance. The heavy traffic made repairs and maintenance difficult and there resulted a period that has been described often by the enemies of the single-phase system, as characteristic of such. That this is not the case is abundantly shown by later experience.

Temporarily, however, there were a great number of heavy short circuits. These threw a heavy strain on the switches and an epidemic of switch trouble resulted. The men who solved that problem have reason to be proud of their achievement for solved it was and completely so. A short on that system today is a frequent occurrence due to the multiplicity of overhead but it is merely an incident and does not in any way interfere with the operation of the road except as it may incapacitate a single unit, and even this circumstance is rare. The switches and the system recover instantly from such a short and power is maintained on the lines while this is being done. The section of overhead and the train unit affected are isolated at once and the rest of the system scarcely experiences the disturbance. Indeed, in most cases the affected parts are at once put back into service and in a majority of cases they are found to be perfectly operative. Many of the cases of troubles burn themselves clear or consist of open air arcs that will not restart when once interrupted.

The trouble at this installation was solved by an evasion. The problem was somewhat simplified by the fact that there was practically but one feeder to protect and if a single circuit breaker could be devised that would handle the output of the station at all times of normal load and overload the difficulty would be overcome. A breaker was devised with this in mind, and still stands between the line and the power house fully protecting the system. It is a somewhat expensive and complicated device housed in a small building, and it consists primarily of a large resistance capable of taking the full output of the station for some seconds. This resistance is gradually cut in when a short occurs and before the line current in the damaged section is interrupted. With this resistance all cut in, the line current is reduced to about 2500 amp., and this current is well within the capacity of even the smallest and cheapest switches to open. Certain other incidental advantages were obtained but they are outside the scope of this paper.

It was appreciated that the solution at this installation while a neat one, would not be applicable to stations with a multiplicity of feeders on account of the complication and expense and that a more general solution would have to be found. It was also appreciated that no more laboratory experiments would be sufficient and that some one would have to take some chances and wilfully short circuit some big power houses in the presence of an oscillograph. That there were found operators that were willing to do this speaks well for the broadmindedness of the men engaged in this work. The results of a short circuit are often so appalling that it would have been entirely reasonable for operators to absolutely refuse to put their stations to any such use. It was appreciated that it would be impossible to ever make material progress in the art unless such chances were taken and operators were located who were willing to endure under predetermined conditions what they often had to without notice and under conditions that they could not control. With the necessary equipment of breakers and oscillographs, a number of tests were run.

The general method of making these tests is also generally understood. The circuit breaker to be tested is closed on a short circuit. The ammeter element of the oscillograph is put in series with the short and the voltage element is connected across the terminals of the breaker. An electrically operated switch is connected in series with the breaker to be tested and is left open until the test is actually made. It is evident that there will be neither current nor voltage in the oscillograph with the switch open but as soon as it is closed a heavy current will flow and there will be a slight voltage due to the drop through the short circuit and the breaker to be tested. As soon

as the circuit is opened by the breaker there is full voltage across the terminals of the oscillograph element and if the circuit is opened at any other point there will be no voltage. This permits assurance that there will be no mistake about the circuit being opened by this breaker. A connection is then made so that the shutter of the oscillograph will be opened by the closing of the switch. In dealing with heavy currents shunts and transformers are used to reduce the current and voltage in the oscillograph elements to usable values.

Everything being ready the operator signals for a short and closes the switch. The breaker being closed, the switch is then closed this opening the oscillograph shutter just before the contacts come together. This is always desirable but not always possible and in case the circuit is made a little before the shutter is opened the current line will start out at a maximum value in the place of zero. The first one or two current waves are generally somewhat distorted and magnified and the current on a heavy overload for the machines starts to decrease, each successive wave being slightly smaller than the preceding one. There follows the opening of the shutter and the closing of the circuit an interval during which the various mechanism involved is getting under way. Relays have to act and the natural inertia of all the mechanism involved has to be overcome. This usually takes about one-half second on the general types of breaker now in service. The duration of the arc is usually quite small, it lasting in most cases only a fraction of one alternation. Following this arcing period there is a short interval during which the voltage is normal followed by a closing of the shutter.

By means of two three element oscillographs it is possible to record the voltage and current on all three phases but such an arrangement is rarely of any considerable value. After seeing the results of many tests the following conclusions seem to be true.

(a) In most cases of what may be termed normal operation the current line does not cross the zero line after the contacts start to separate. Even under these conditions the breaker may show considerable distress, throwing oil and emitting smoke (I have not had an opportunity to see tests on voltages above fifty thousand with heavy currents and I cannot say positively that on these higher values the current does not restart but on voltages below this I am satisfied that the normal condition is that of a rectifier the current falling to zero with little or no distortion and not restarting.)

(b) That the voltage across the arc is always low indicating that the arc path is of very low resistance. With a line voltage of 11,000 the combined drop across two arc paths is generally below one thousand volts.

These two conclusions explain much of the phenomena noticed in connection with such tests. We have a low voltage high current arc that starts sometime during a current wave and falls to zero following the natural shape of the current wave. Since the voltage across the arc is small the amount of energy in an alternation or part of an alternation is small. This energy is expended in heating the contacts and vaporizing them and in heating and vaporizing the oil. The critical moment comes when the current reaches zero and starts to reverse. The contacts have separated a little and the space between is filled with a mixture of gas and oil. The current is zero and it must start by jumping across this gap. At a certain critical value of gas it will do so. Having once established itself it will generally have an easier time at the next zero point as while the contacts have separated a little more there has been a full alternation during which the accumulation of gas has been relatively more rapid. It is far from proved but it is my belief that if a breaker holds over for one alternation that it will hold over for several with more or less disastrous results.

These will vary from a vigorous spurt of oil to a complete destruction of the apparatus. That heavy pressures occur is proved by the heights to which oil is thrown and the distortion of heavy tanks that accompany such explosions. Large variations are often observed in the performance of similar breakers under what appear to be similar conditions. This is due partly to the fact that the actual opening of the contacts in one case starts soon after the current begins to rise and there results a full alternation during which the arc persists and in the next case that the arc is started low down on the current wave just before it reaches zero and the time and energy involved are materially less.

Having in mind this theory of the action of the circuit breaker it will be profitable to examine the various ways in which it has appeared likely that the action of such devices could be improved. These are as follows:

(1) Mechanical displacement of the arc. One of the oldest ways of extinguishing a flame is to blow it out and the general plan of blowing air across an arc has been used many times with excellent results. It would seem that it would be an excellent way to extinguish an electric arc. It will extinguish an arc and compared with the alternative of letting the arc "hang on," it is efficient. But it is immeasurably slow when compared to the rectifier action of an oil breaker. There have been numerous patents granted on the general principle of wiping an arc out by fanning or forcing oil across the contacts. They are, so far as I am familiar with them useless. The time involved in the action of a circuit breaker is so short that any such movement becomes more or less microscopic in that time. The general plan of forcing oil under pressure through the arc path has been a favorite scheme and tests have been made where a breaker was equipped with nozzles of various types and a stream of cold oil under pressure was forced violently across the path of the arc. A good sized pump furnished the oil and the result was absolutely conclusive. The breaker threw as much oil and made as much smoke with the oil jets as it did without them and no difference in the shape of the oscillograph curves could be noticed.

In the same class come the various directions of break. It is claimed that a horizontal or an upward vertical break is superior to a downward vertical break on account of the better characteristics. It is claimed that the natural movement of the oil assists the break in these cases. There are some reasons for a preference in regard to the direction of break but so far as the ability to open the circuit is concerned there is but little difference. The contacts

separate a short distance and the arc goes out in so short a time that there can be no material movement of the oil body. If the arc is going to persist for so long a time that the gases are going to have a chance to move any great distance the amount of energy involved will be great enough to blow the oil out of the tanks entirely and such a movement is of no value.

(2) Magnetic displacement of the arc. There exists a well defined magnetic blowout effect due to the distribution of the magnetic flux linked with the breaker and the design should be such that full advantage should be taken of this point. The vapor path has little weight and comparatively small forces will accelerate it rapidly. It should be borne in mind however, that the efficiency of a magnetic blowout in oil is much less than the same blowout in air as the oil dampens the movement of the gases. The commonest application of this magnetic blowout principle has been worked out on railway apparatus and there again it is more efficient, as we have a continuous flux and a continuous current and there is not the intermittent and sometimes conflicting condition that an alternating arc offers. Also by using suitable iron circuits the flux can be concentrated and directed so that it acts with great efficiency. All things considered the magnetic blowout effect is much less valuable than has often been assumed and one should not hesitate to sacrifice it if other great advantages could be gained thereby.

(3) Quicker breaks. At first sight it would seem advisable to have a breaker open as quick as it is physically possible to do so. This subject is somewhat obscured by a little ambiguity as to what we mean by "open." There is first the interval of one-half second during which we are waiting for the various mechanism to get to the actual point where the contacts separate and secondly we have the time during which the contacts are actually separating and the arc is persisting. We can lengthen the first period indefinitely by the use of time element relays but the second period depends almost wholly on the frequency of the circuit and the more or less accidental relation of the instant of separation of the contacts and the value of the current wave at that instant. There can be no question as to the desirability from a circuit breaker point of view of lengthening the first period. The longer we can delay the moment that the breaker has actually to take the arc the better chance it has. The generator is losing its field due to the armature reaction. The prime mover is slowing down and everything is getting hot and the resistance is rising. It is common practice to put in cheap breakers and give them a 4 sec. time element so that they will benefit by all these factors. This theory carried to its logical extreme results in non-automatic switches or circuit breakers with an infinite time element. This is an evasion, and given a circuit breaker that will stand the strain. it is advisable to get the circuit open as soon as possible. A quicker mechanical movement of the circuit breaking parts will result in this but there will also result a longer arc path being drawn out in the alternation that ensues before the current has a chance to reach its natural zero. This is advisable in that it will result in a longer path to resist the restarting of the arc. Suppose however, that we already have a long enough path to stop the current. In this case all that a longer path will give us is more gas. That is the longer path will have a higher resistance and consequently more energy to dissipate in vaporizing oil. Remember that the resistance and the voltage across even quite long paths, say 6 in. is very low and that the effect in reducing the current due to this resistance is small. It is evident that when we start drawing an arc longer than that needed for the purpose of preventing restarting that we are actually putting more strain on our breaker without additional gains to compensate for it. An attempt was made to find out what effect quicker breaks would have on a 6600 volt breaker working on about 3000 amp. overload. A heavy weight was dropped from heights up to 20 ft. on a pair of contacts thus violently jerking them open. Various heights were tried and the oscillograph indicated that there was no great difference in the wave form due to the various heights. In one case the weight falling from a height of about 16 ft. rebounded and let the contacts close again so that we had on the same film one record that represented a very quick break and a second record of the second break due to the weight pushing the contacts apart at a slow rate. The two records were practically identical showing that very little good was accomplished by the quicker break.

It is hard to make a definite statement on this point but it seems to me that we could gain by increasing our speeds somewhat especially in the larger breakers and in those opening high voltages. For 11,000 volts and below I do not think that more speed will be of much value.

(4) Resistance insertion. The Long Island Station of the Pennsylvania railroad has seven breakers that insert resistance before they open the circuit. These breakers were adopted after severe tests had proved that they were a step in advance of any then existing breaker. They were an attempt to incorporate in a small space the principle that made the N. Y. N. H. & H. R. R. installation a success. The above company had a station completed and the space provided for standard breakers before it was decided to adopt this type and the design was naturally very difficult and the parts very much crowded so that this cannot be regarded as a real test of the possibilities of this breaker. Some designs have since been proposed where a reactance is inserted either in one or several steps before the circuit is actually broken. Tests show that these breakers function better than the standard types now in service and there will doubtless be some development along these lines. These breakers, however, are not the final answer. To understand this statement it will be necessary to consider the action of such devices at some length.

[To be continued.]

Machinery Hall is the largest exhibit building at the P. P. I. E. and this points to the significance of the era following the opening of the canal as one of intense industrial development on the Pacific Coast. It also emphasizes the policy of the exposition officials to give precedence to whatever will add to the educational value of this Exposition and the selective rather than collective gathering of exhibits.

WHAT IS AN ENGINEER?

BY ARTHUR A. NOYES.

(Address delivered recently before the Throop Assembly by Dr. Noyes, who is Director of Research Laboratory of Physical Chemistry at the Massachusetts Institute of Technology, and Professor of General Chemistry at Throop College of Technology. —The Editors.)

When President Scherer invited me to speak to you, the best subject that I could choose, since you are all to be engineers, seemed to be: "What is an Engineer? What are his opportunities and functions, and how can the student of engineering best prepare himself for engineering work of the highest type?" For it is important to have the goal constantly in sight so that he may work directly towards it.

What, then, are the functions of engineers of the highest type? We may answer, I think, that they are to be the leaders in the scientific development of the commercial and industrial enterprises of the country. They are to apply scientific knowledge to the arts. Engineers are not skilled artisans who have mastered the technical methods of the arts. They are not machinists, electricians, draftsmen, or chemical analysts—men who do the routine work of industry; but they are the men who install new plants, build new structures, improve existing processes, and develop new ones. It is true the engineer must acquire the technique of his profession. He must measure accurately, draw clearly and neatly, and analyze with absolute certainty. Yet these are incidental accomplishments, not the main powers which the engineer must develop; and it is a real danger in technological education, where much time has to be given to acquiring manipulative methods and technical knowledge, that the student will come to regard these as the main purpose of his education. There is danger that he will not "see the woods because of the trees."

Far more important than mechanical technique is, of course, a good knowledge of the underlying principles of engineering science. This implies a thorough training in the sciences of physics, chemistry and mathematics; for these form the backbone of the science of engineering. Engineering as a science is nothing but applied physics and chemistry—applied with the aid of the exact methods of mathematics. Physics is the science that deals with forces and with energy transformations, mechanical, electrical, and thermal; and it is with these very things that the engineer has to deal. Professor Pupin, the physicist who has contributed so much to the advance of electrical engineering, has given an interesting definition of the civil and mechanical engineer. He has defined a civil engineer as a man who makes things stand, and a mechanical engineer or electrical engineer as a man who makes things go. When a civil engineer builds a bridge he wants it to stand where he puts it; he does not want it to go anywhere. It must stand in opposition to various forces—that of its own weight, the force of moving water, the force of wind, etc., all of which are subject to the laws of physics. When a mechanical engineer, on the other hand, builds a machine, he wants it to go, not to stand still; and in order that it may go successfully, he must devise machines for transforming and transmitting energy of various forms. But these energy transformations constitute the most fundamental subject with which physics has to deal. In his structures, moreover, the engineer must use a variety of materials—wood, stone, iron and steel, cement, mortar, asphalt, paints, etc., all of which form part of the subject matter of chemistry, which may well be defined in a somewhat popular way as the science of materials and of their transformations into one another. Perhaps I may cite one or two instances of the importance of chemical knowledge to the engineer. Such are the prevention of chemical corrosion by air and water, for example, of steel and concrete structures and of boilers, thereby avoiding losses of many thousands of dollars; the production of car wheels and steel rails of such composition and texture that their permanence can be relied upon; the production of new steels and other alloys for various constructional purposes, tools, etc.; and the production and refining of fuels, and the study of conditions insuring their complete combustion.

The bearing of all this is to show you the importance of doing thorough work in the courses in physics, chemistry, and mathematics, so that you may have the fundamental scientific basis for your engineering work. Remember, too, that in engineering subjects themselves it is the principles rather than specific industrial applications or technical methods that you need to get here at college. The details of engineering practice you will more readily and more satisfactorily acquire when you enter upon the work of your profession. Remember that a knowledge of theories is especially likely to be of value. In scientific usage the term "theory" is not contrasted with practice as it is apt to be in every-day language. In science a theory means a body of knowledge derived from or based upon fundamental principles; and it is more important to know principles than facts, because a principle embraces a multitude of facts.

It is true that no less important than the possession of this fundamental knowledge is the power to apply it. Your employer will be interested not in what you know, but in what you can do. The other thing besides fundamental knowledge which you must acquire at college is therefore the power to apply it, and it is natural to ask how this power may be best acquired. It can certainly not be gained by doing your daily work in schoolboy fashion, by memorizing the lessons, or cramming for examinations. The student must not simply learn, he must understand and think about his work. It is better to do half of it understandingly than to cover the whole ground superficially. Of especial importance in developing the power I have referred to is the independent solution of the numerous problems which constitute a large part of the work of any good engineering school. Bear in mind that the main purpose of such problems is not to teach how to do the specific problem that may be given out, but to gain the power of solving any problem of the kinds that will be presented to you in your subsequent engineering practice. Very little good will therefore come from studying problems which have already been solved by the instructor, or from copying them from other students.

But there is another side to engineering education. After you have learned the science of engi-

neering you are to practice the art of engineering. This means that you are to be not only men of science, but men of affairs, men with large responsibilites, men who have to deal effectively with other men. There is thus an important human element in the work of the engineer. A member of one of the largest engineering firms in this country recently said to me, "When I want a man to deal with things I employ a graduate of an engineering school, but when I want a man to deal with men I prefer a graduate of an academic college." In so far as there is truth in this remark it shows to us a danger in technological education—a danger against which we teachers and students must guard; for it is those that combine the power of dealing with things with the power of dealing with men that secure the positions of highest responsibility. The scientific training of engineering schools has many advantages over the general training of the academic colleges. It is thorough and intensive, while that of the college is apt to be superficial and desultory. It has a definite, practical end in view, which insures the interest and close application of the student. It teaches him to think clearly—to analyze a problem and grasp its essential features. It teaches him to work hard; and it is a tremendous asset in life to have learned to work in early life. In brief, it develops those qualities whose importance is so well expressed by the psychologist, William James, in his great essay on "Habits," in which he says, "The man who has inured himself to habits of concentrated attention, energetic exercise of will, and self-denial in unnecessary things, will stand like a tower when everything rocks around him and when his softer fellow mortals are winnowed like chaff in the blast."

But with all these advantages there go certain dangers—especially the danger that the engineering student will become only a narrow specialist, instead of a broadminded man of affairs. The engineer has constant occasion to deal with men of all types—men both in positions superior and subordinate to his own—and he must acquire that breadth of view and breadth of knowledge which will make him appreciated by, and appreciative of, men who have had a different training. He must learn to know and to value the activities of life that lie outside his own professional field—those things in which other men are interested. He must appreciate the various kinds of literature and the various forms of art—music, drama, painting. He must take an interest in the political, social, and industrial questions of the day which form ordinary subjects of discussion among educated men. Of special importance to him will be the power to write and speak convincingly, if he is to make the results of his work effective, get his ideas realized, and his plans adopted. As engineers you will be constantly called upon to make reports, and if such reports are to serve their purpose, you must, as one of our Technology professors has recently said to his classes, "Write them concisely, else no one will read them; clearly, else no one will understand them; and convincingly, else you might as well not have written them."

It is fortunate that you are studying in an engineering school where the importance of this liberal side of education is fully appreciated—in a school whose trustees are men of large affairs in many different lines, and whose faculty has been gathered from all types of institutions from all over this country. In consequence, the curriculum of the engineering courses of this school is one of the broadest and most liberal of any in the country. Yet the main factor determining the success of any system of education is the spirit in which its students approach it; and the existence of these liberal studies in the curriculum will avail little, if you do not approach them in the same earnest spirit and with the same interest which you give to your professional subjects. Remember that you are spending here four of the best years of your life at a large expense of time and money, and that you will not get out of it your time's worth and your money's worth, if, for the sake of the purely professional subjects, you neglect the liberal studies in literature, foreign languages, history, politics, and economics, or the fundamental scientific studies of physics, chemistry and mathematics. If, on the other hand, you make the most of all these opportunities you may be sure that you will be well fitted to fulfill the ideal expressed in the closing words of our own Technology song:

"Each man in his chosen place
Beats out on the anvil of human toil
The good of the human race."

WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY.

Annual Report, 1914.

The board of directors has presented the following report of the operations of the company and its subsidiary companies for the fiscal year ending March 31, 1914:

The income account for the year was as follows:

Gross Earnings—		
Sales billed		$43,733,645.77
Cost of Sales—		
Factory cost, including all expenditures for patterns, dies, new small tools and other betterments and extensions; also depreciations of property and plant, inventory adjustments and all selling, administration, general and development expenses		39,016,423.39
Net Manufacturing Profit		$ 4,717,222.38
Other Income—		
Interest and discount	$ 454,998.94	
Dividends and interest on Sundry stocks and bonds owned	718,282.12	
Miscellaneous—Royalties, etc.	107,574.76	1,280,855.82
Gross Income From All Sources		$ 5,998,078.20
Deductions From Income—		
Interest on bonds and debentures	$1,042,101.53	
Interest on collateral notes	591,259.68	
Interest on long term notes and mortgages	72,554.06	
Proportion of expenses incidental to bond and note issues	133,750.00	
Miscellaneous	99,514.21	1,939,269.48
Net Income Available for Dividends and Other Purposes		$ 4,058,808.72

The sales billed and net income for the year are both in excess of the previous year. The ratio of manufacturing profit to sales billed decreased due to severe competition and to depreciation charges which were this year included in cost of sales. Last year depreciation charges were deducted from income.

The value of unfilled orders on March 31, 1913, was $12,061,473; on March 31, 1914, the value of unfilled orders was $7,951,385. The average number of employes during the year was 18,635 as compared with an average of 20,542 for the previous year.

ELECTRICAL DISTRIBUTION

CONSTRUCTION AND MAINTENANCE OF UNDERGROUND SYSTEMS.

(The following recommendations which have just been published by the Oregon Railroad Commission, are considered unique, and should prove invaluable to operating companies. They were born of necessity and Oregon power companies were called into consultation during their compilation.—The Editors.)

Printed Rules; Compilation and Distribution.

Printed rules shall be prepared by each utility and a sufficient number of copies issued that each employe who may at any time be called upon, in any manner, to do underground work or supervise same, shall be provided with a copy of said rules.

A record shall be maintained in the Territorial District, division or general office of each utility, as the case may be, of the signatures of all employes so provided with copies of these printed rules, such employe's signature being an acknowledgment of service of said rules by the utility for whom he may be employed.

Protection Against Accidents.

At all times during the progress of work in manholes, when workmen are in the manholes, or during the period when covers are removed therefrom, a competent workman shall be stationed as a guard or watchman, on the ground above, at or near the entrance to said manhole, and such workman shall at all times be in a position to supervise the immediate vicinity of said manhole and shall be so located as to have the manhole barricade and the immediate surroundings within his clear vision.

A barricade shall be maintained around the opening to the manhole and be of such type as to furnish ample protection against accidents at all times during the progress of work therein. There shall be displayed from the top of such barricade, at a distance of not less than 5 ft. from the ground, a red flag of dimensions not less than 10x15 in.; and said flag shall be in such a position as to be in full line of vision from all directions. In addition thereto, from dusk until daylight the following morning, red lights shall be maintained in such positions as to warn the public approaching in any direction.

The regular manhole cover shall be replaced on same during all periods that workmen are not on duty.

Fire and Gas.

It shall be the first duty of all workmen opening and entering manholes to first carefully inspect for gases, and under no circumstances shall a light of any description whatsoever be allowed to enter the manhole until it has been positively ascertained that gases do not exist therein.

In such cases as it is found necessary to use a blow-torch in wiping joints, inspection for gas shall be made immediately prior to the introduction of the lighted torch in the manhole. During such period as the workman shall be using a lighted torch or fire of any description therein, the guard above ground shall be at the upper entrance to the manhole.

Smoking in manholes or at the opening thereof shall be positively prohibited at all times.

Under no circumstances shall a fire be maintained for the purpose of furnishing warmth for the workmen in the manhole, or within a distance of 10 ft. from the opening to manhole.

In all cases where it is possible, electric light shall be furnished. Where impossible to furnish electric lights, acetylene gas burners shall be maintained; the tank furnishing the gas shall at all times be located above the ground and the gas burners supplied by means of rubber tubing. Lanterns and candles should be used in manholes only in cases of absolute emergency, when making the initial inspection in cases of trouble, and when it is impossible or impracticable to secure such electric or gas lights as above prescribed.

Heating of Wax or Metal.

At no time shall wax, compound, paraffine, metal, or any other substance be heated within 10 ft. of the manhole opening. The furnaces or fire-pot for heating same shall also be maintained at a distance not less than 10 ft. from the opening of said manhole.

Covered vessels containing heated paraffine, wax or compound shall never be lowered into a manhole. The cover shall be removed from the vessel not less than 10 ft. from the manhole opening.

Protection to Service.

Splices in a temporary condition shall be allowed to remain in such manner only the least possible time, and shall be provided with such insulation as is common practice, and in so far as possible provide protection against moisture entering same.

In all cases the cable or cables should be returned to normal condition at the earliest possible moment, and if service be affected the work should be continuous to the end of restoring service to all patrons.

Cleaning Manholes.

All debris, such as paper, insulated ends of wire, rubber insulating matter, or any other substances of an inflammable nature, shall be removed at least once a day during the progress of the work.

The manhole shall be thoroughly cleaned of all debris upon the completion of each piece of work. A regular inspection of all manholes and cleaning of same shall be made in the spring and fall of each year.

Extent of Application of Preceding Rules.

Such rules or practices as may be in effect or employed by the utility, not in opposition to the above, shall in no wise be affected or altered by these rules.

Observance of the foregoing standards is recommended by the commission to all utilities, from the dual considerations of safety and efficiency of service. It is not deemed necessary, at the present time, to institute formal proceedings looking toward the issuance of any formal order in the premises, but such course will be followed in the event that standards of construction and maintenance are not voluntarily made such as to secure the utmost efficiency and safety in service.

SELLING ELECTRIC SERVICE

THE THREE TYPES OF MANAGEMENT.

BY E. ST. ELMO LEWIS.

(The first of a series of three articles on the subject of Management. The author is president Detroit Executive's Club; first vice-president National Association Corporation Schools, and advertising manager Burroughs Adding Machine Company. The Editors.)

Strenuous or Rule-of-Thumb Management.

It is important for us to recognize in the very beginning of any consideration of the question of costs, that a cost system does not unfold itself as a logical consequence of starting a business with a bookkeeping department. A cost department is an entirely different unit. A cost system is not based upon the pre-determined scheme of things which flow from one to another in an inevitable and logical sequence. A cost system is the reflection of a man's mind, of his manner of thought, of his education, of his sympathy, of his training and experience, of his ability to manage, to analyze, to synthesize, to coordinate, to harmonize, to grasp things in detail and in the large. We understand that cost keeping at its best is an efficient method of determining exactly what time, work, and material is put into the production of any marketable energy, commodity, or service.

Do not make the mistake of thinking that manufacturing is limited to things that you can weigh on scales or measure with a foot rule. The electric light company manufactures a product as well as the automobile manufacturer. The railroad company manufacturers a product as well as the sugar refinery. The banker manufactures a product as well as the hat manufacturer. The department store manufactures a product, and so does the doctor, the lawyer and the advertising manager.

The mere fact that in some of these a definite standard of measurement has not been obtained, does not preclude the idea that their work can and must be measured and its value approximated. Therefore, no man should adopt the attitude that they can't be measured. Some people think that advertising can't be measured. This is not because it can't be measured—it is because their education, their experience has not progressed far enough to give them the ability to measure it. The savage seeing the lightning in the sky would probably find it possible to imagine that the electric fluid could ever be measured, but it is being measured. The main purpose of any cost-keeping system is to find measures for many things that can not be measured by the ordinary bookkeeping processes, or by the mere senses of careful foremen, and thereby arrive at standards of usefulness and value and determine relative costs of production for guidance in forming policies.

If a cost system is a reflection of a man's mind, or of the minds of a number of men, it becomes very important to find out what kind of men they are.

There are three fundamental types of men in the world. There is the Strenuous type, the Systematic type and the Efficient type. These types fall into divisions, determined by the methods they use and all of their mental and physical equipment. All these types are reflected in cost keeping systems. The strenuous man, for instance, is the hard working type. He may be called the "sweat" type. His philosophy in life is embodied in do it now. He is a doer worker of muscular type. We have had thousands of them in our factories as managers. They are busy—busy-ness is business with them. They are the men who get down to the office at six o'clock in the morning and work until ten o'clock at night. They never think of the factory hygiene, of lighting, of plant planning, of functionalizing, of standards, of education. Their ideal is hard work. They take literally the proposition that man must gain his livelihood by the sweat of his brow. When everybody worked that way, of course, strenuosity was the order of the day. It didn't make any difference—the world was on a sweat basis. Then the man who was the most strenuous, made the most money in feeding a hungry market. It was a brute force—physical stamina that won. One unskilled laborer was so good as any other unskilled laborer. But when skill came into competition with the man at the bench; when brain, forethought, planning and thinking came into competition with the strenuous manager, then came the demand for protection, and the outcry against competition.

The purely strenuous type can be seen in a bookkeeper who works hard, who is loyal, but who fusses and fiddles over things, but the rule-of-thumb or strenuous man is the type that believes if he lowers his cost each month or each year, he has gained highest efficiency.

He maintains that his business is different from any other business. He thinks the only thing worth taking from anybody else is to steal a patent, or to steal a man who has shown that he can do more than anybody else.

The rule-of-thumb man says "each man is different," that "you can't teach salesmen," that this man who is doing things so successfully has an unusual faculty possessed by nobody else.

His apprentices "learn by doing" (the good and the bad things); he hasn't any school of workmen (they already know). A school for teaching salesmanship would make him laugh—and yet he is buying his cash registers, his adding machines, his insurance policies and his loose-leaf devices, if he has any, from salesmen who have been taught in schools how to sell the produce to just such a man as he.

The rule-of-thumb man never joins business organizations except to be a good fellow—he never makes a research to find out new things—he calls it "high-brow theory." You can't tell the rule-of-thumb man anything, because you cant' tell any man anything that he doesn't know.

The rule-of-thumb farmer plants by the almanac and reaps by the grace of God.

The rule-of-thumb mechanic has learned his good and bad methods by the side of an older mechanic, who learned his good and bad methods from another. Each loses a certain amount of efficiency in the process of learning. He doesn't study trigonom-

etry or geometry. He doesn't care anything about such "high-brow stuff," but he is a loyal member of his organization and talks against capitalists "who don't do anything."

The rule-of-thumb employer cares nothing for co-operation. He sees nothing but competition. The only kind of organization he wants to belong to is an anti-union organization. He is an anti-laborer; he believes that you have to use the big stick, that you have to drive men instead of lead them because, "Well, you see, that's the way it always has been done, and my father did it that way."

The rule-of-thumb banker, the rule-of-thumb retailer—all of them have ingrowing businesses because their education has never gone beyond the confines of their own particular experience.

They can imitate, but they can't adapt.

They don't really think about their business—they only think about the dollars and cents.

They don't think about men, but they think about machines.

Their costs are necessarily nothing but approximations, more or less distant, of an ideal set by the men who have worked under different conditions of a more or less distant past.

In such a plant you see do it now signs all over the place. In such places salaries are raised by the time clock and calendar. Such a manager has no methods of measuring men's efficiencies because he doesn't know what those efficiencies are.

His ideal of a cost system is a crude method by which the piece workers can be prevented from getting more than he thinks they are worth. He says no laborer is worth more than $2 a day because that's all he has ever paid, and he is perfectly satisfied if a salesman increases his business 10 per cent a year in his territory. If his competitor lowers prices, he wonders where his competitors "steal" the raw material. "How long can he continue to lose money?" It never occurred to him that a man can beat him at his own game and make a fortune in the process.

He doesn't analyze his business and its possibilities to find out the real reason for his success or failure. He hasn't time. He is "too busy doing things."

In the hiring of people, his ideal is to "try them out—see what they can do." The try and fail method is a gospel to him. He solemnly asserts that "you can't tell what any man is able to do." "That other concerns are foretelling and finding out what types of men are necessary for certain jobs, are pre-determining what men will fit the jobs and then getting the men to fit the jobs, is a joke to him.

Of course you can't tell him anything about it because he doesn't know anything about it.

He doesn't know anything about the idea because he has never seen it at work. If he did see it, he would probably dismiss it with—"The employment manager was better than usual"; but as for finding law or principle in any course of action, he dismisses it with, "It is the man who is doing the work, and the man who is getting the results."

The rule-of-thumb manager prides himself upon "knowing his business." He never thinks of using outside counsel. If a man would suggest to this type of mind that there is a better way in which to grind a valve, his first question would be, "how many valves have you ground?" In other words, his attitude of mind is of the man looking in the mirror when he is looking for all the reason for success.

It is a type of mind of which we have had entirely too many, and which competition and the efficiency of skilled minds, applied to skilled work, is gradually forcing out of American business. These rule-of-thumb managers act as the priests of old, adopting a precedent as a sacred flame which has passed from hand to hand, from generation to generation, each keeping it inviolate, never changing it, until it becomes a sacred tradition before which youth, and skill and brains and power must bow in submission. The rule-of-thumb manager is always a liability and never an asset. He may be popular, he may have succeeded, he may be succeeding, but just as inevitably as the sun rises, his day is done.

GOVERNMENT TELEPHONES.

A report of Postmaster General Burleson on "Government Ownership of Electrical Means of Communication" has been going the rounds of the press, and inasmuch as it bears the "Pure Statistic" stamp of the government it is accepted as an accurate presentation of the thing it relates to. Among other things it contains is a table giving comparative long-distance telephone charges in various countries for one thousand miles. This table claims the following figures as official:

Telephone Charge for 1000 Mile Message.	
Norway	$0.40
Germany	.48
Sweden	.54
France	.58
Japan	1.37
United States	6.00

These figures were exceedingly interesting to readers until a disagreeable chap on the Minneapolis Tribune did a little measuring in those countries where these thousand mile rates prevail, and he found:

First: That a telephone line a thousand miles long in Norway and Sweden would reach beyond the region inhabited by users of the telephone.

Second: That the longest straight line in Germany is about eight hundred and fifty miles.

Third: That the longest straight line in France is less than eight hundred miles.

Fourth: That the longest straight line in Japan is about five hundred miles.

And finally: That between these countries there are no international rates!

All of which suggests first the possibility that we have a government-controlled statistic factory concealed somewhere down at Washington and second, that after all that was a wise remark of good old Josh Billings when he observed: "It's better to know nothin' at all than so much that ain't so!"—John Kendrick Bangs in Concerning Municipal Ownership.

Increase in population of Pacific Coast states is shown by statistics of the Census Bureau to have been considerably greater during the past decade than in any other part of the United States.

USE OF THE DIESEL ENGINE IN THE NAVY.

BY C. H. WOODWARD, LT. COM., U. S. N.

(The following is from an address given by Lt. Com. Woodward upon the occasion of the commencement ceremonies of the installation of the initial exhibit in the Machinery Palace, Panama-Pacific International Exposition.—The Editors.)

The most important question in shipbuilding to-day, as it was a century ago, when steam power was first utilized, is that of propulsion.

Many wonderful inventions along this line have been made in the meanwhile, of course, but the greatest improvements have been recorded during the past fifteen or twenty years. Most notable among these are the water-tube boiler, the turbine, superheated steam and last, but not least, the Diesel engine.

The Diesel engine has a big future before it.

As many difficulties were encountered with the marine steam engine and the turbine, at the outset, however, so are there many unsolved problems with the Diesel engine to-day. Even though it has made wonderful strides in the past decade, it is still in its infancy so far as marine installation is concerned, and much preliminary experimental work remains to be done before it reaches that degree of development of the steam engine. Its early adoption for propelling large vessels is unlikely, but its ultimate adoption is almost certain.

It must be borne in mind that the advent of the turbine and economics resulting from use of superheated steam, together with other recent improvements in efficiency of the steam engine, have rendered the task of advocates of the internal-combustion engine more difficult. Moreover, the replacement of the turbine steam engine by the oil-engine involves a return to the reciprocating type of machinery which is, in itself, a ground of objection as being in a sense a retrograde step, for at present there seems to be no prospect of the evolution of a successful turbine oil engine.

The stage of development that the Diesel engine has now reached, however, is such that it's bound to receive serious attention when the question of the means of propulsion is considered.

The principal disadvantages of the steam engine as a means of propulsion is the great loss of efficiency due to the complicated indirect development of power by generating steam in a boiler, while the oil motor short circuits this intermediate member, and develops the power directly at the point where it is required—namely at the engine itself, thereby increasing the overall efficiency from about 7 to 12 per cent in the case of the steam engine to about 22 to 35 per cent in the case of the Diesel engine.

In other words, the cost per h.p. developed by the Diesel engine is between one-third and one-quarter that developed by the steam engine. Thus it will be seen, that the abolition of the boiler which constitutes a constant source of care and danger and requires a large, well-trained staff for operation, not only increases the efficiency of the plant, but also reduces considerably the weight and space occupied by eliminating coal bunkers, stacks, boiler room and boiler room auxiliaries, which can be converted into storage space for cargo, and reserve fuel may be stored in double bottoms and parts of the ship that were formerly waste.

The oil engine has a marked superiority over the steam engine in many ways, for in addition to its economy in regard to space, fuel and attendance, the ship's radius of action is about doubled, labor is reduced, fueling is facilitated, and stand-by expense is eliminated, as the engine can be started cold, at a moment's notice.

Unfortunately, however, there are many difficulties attached to the construction of marine Diesel engines with large cylinders at the present time, but so much attention is being given to the subject by eminent engineers that it is confidently expected that these difficulties will be overcome.

Diesel motors have proved both capable of standing long runs as well as capable of further development in power. However, comparatively few vessels of over one thousand h.p. have been in service long enough, as yet, from which to get proper data, consequently we are not sufficiently advanced to install very large units. Meanwhile the use of Diesel engines of moderately high power on shore is making steady progress, and much has already been accomplished in its application to marine work.

Many of our latest submarines are equipped with this engine, and contracts have been closed by the government for their installation in others that are now building, and while the Diesel engine is an ideal source of power for a submarine, we do not look on the present designs as final. We expect great improvements, and both the builders and government officials are constantly studying the situation with this end in view.

Due to its increasing reliability the Diesel engine has been adopted in place of the cruising turbine in several of the recent destroyers (Firedrake class) built by the Messrs. Yarrow for the British Navy, because its consumption of fuel is considerably less. Diesel engines for use at cruising speeds maintain a high enonomy and it is estimated that this installation will increase the radius of these destroyers, at economical speed, from 3000 to 8000 miles. Of course, these destroyers are also equipped with boilers and high power turbines to be used for full speed, as the propulsion of destroyers at full speed by Diesel engines is not practicable.

Diesel engines may also be used for auxiliary purposes in large ships, enabling them particularly to use electric light and power in port with minimum attendance and considerable economy due to their independence of boilers.

Our own navy is building, right here at Mare Island, two large colliers—the Kanawha, which will be equipped with reciprocating engines, and the Maumee, equipped with Diesel engines. This is being done in order to find out in a practical way the comparative economy between the two types. Both vessels are identical in size and power, having the following characteristics:

Characteristics of Colliers Now Building.

Length	475 ft.	Displacement	14,500 tons
Beam	56 ft.	Horsepower	5,000 h.p.
Draught	26 ft. 4 in.	Speed	14 knots

The Kanawha, which is at present on the ways, will be launched in about one month and immediately after the Maumee's keel will be laid on the same ways. The Maumee's engines are to be of the twin screw, Disel two-cycle type. Each engine will have six cylinders, 24 in. dia., and three scavenging cylinders. It will require 120 r.p.m. to obtain the 14-knot speed. This will be the first large sea-going American vessel fitted with Diesel engines.

Results from the tests of these two ships will be carefully studied, and will have a great deal to do with our future policy in equipping large colliers and other vessels.

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POWER AND GAS

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REMOVAL NOTICE.

In order to care for increase of business and to facilitate publication, the offices of the Journal of Electricity, Power and Gas have been removed from the Rialto Building to more commodious quarters in the new Crossley Building, corner New Montgomery and Mission streets, San Francisco.

Capitalizing Hope

There is being gradually fastened upon public utilities a code of conduct of their business which differs widely from that formerly accepted. Utilities are apparently a thing apart; the disadvantages under which they are required to operate being forced upon them under the specious plea that actually, because they have so great a number of customers—have developed so magnificent a service—they are thereby required to share with the public they serve part of the reward which their speculative enterprise and skill has produced.

The circumstance of determining the capitalization of utilities for rate-making purposes, for example, leaves but the bare bones of the business upon which to build the small percentage of profits permitted.

In this operation depreciation is determined and deducted, but appreciation, built into the business while this has occurred, may be disallowed. This is not definitely decided.

A finding of the Master in Chancery in the suit brought by the Pacific Gas & Electric Company against the City and County of San Francisco to prevent the ordered gas rate from going into effect and which went adversely for the company, disallowed in reducing the stated amount of the company's capitalization the item of "good will."

Fifteen per cent was deducted by the Master for "depreciation," which item, though less in proportion than the amount claimed by the company for "good will," is of greater magnitude in that deductions for depreciation are constant, while good will, once capitalized, is comparatively slow of growth.

On the other hand, a unanimous decision recently handed down by the New York Court of Appeals on the Kings County Lighting Company rate case recognizes and defines this item of "good will" or "going value," which is therein stated, for rate-making purposes, to be:

> The amount equal to the deficiency of net earnings below a fair rate of return on the actual investment due solely to the time and expenditures reasonably necessary and proper to the development of the business and property to its present stage, and not comprised in the physical valuation of the property.

While this decision and definition is not all that might be wished for, yet it is a step in the direction desired, namely, recognition of the intangible though valuable asset of community friendliness, or good will.

In the public utility business the conservation of efficiency necessitates the cultivation of good will, for it reduces selling costs, otherwise necessary, and the excessive legal cost of engaging in that business.

It is permissible in the interests of improved service to scrap equipment not outworn, but made obsolete by invention. These improvements are capitalized, and it should similarly be possible for public utilities to capitalize efficiency of whatever kind.

Whether under monopolistic conditions or in competitive areas, the great signification of good will lies in the fact that it constitutes a hope founded upon a probability of business perpetuity and expansion because of past satisfactory service.

Surely this invests the business with a value above the actual selling price of the material assets, and thus makes possible the capitalization of hope and a rate of return more commensurate with the effective utilization of investment.

Sectionalized Effort

There is a similarity between national organizations and the advertising medium with a large general circulation, which it will be profitable to consider. Value is the measure of desirability in each instance.

None will question that they have value, but the question does arise as to whether maximum value is secured from use of the one or membership in the other. This depends of course upon the particular use desired of either.

As a technical journal and technicians of specialized employments, consider their use for specific purposes.

The medium with a large general circulation has but little value for specific advertising—paid publicity of interest only to a known few—and much of an advertising appropriation—these rates being usually based upon circulation—is therefore wasted.

The manufacturer of turbo-generators, to make the argument instantial, could perhaps reach as many interested executives and engineers through the pages of a popular magazine as through a technical journal, but the latter's smaller, because specific, circulation, permits lower advertising rates, though not necessarily proportional to the circulation difference.

Moreover, there is a greater certainty of reaching those most interested through the technical journal and at a time when their minds are most receptive to the information given through the advertisement. In the periodical with the general circulation, and therefore written for readers in general, there are distracting counter presentations and the life is usually shorter than that of the technical journal which is kept on file at least temporarily, and often in permanent form.

Subscribers are solicited promiscuously where magnitude of circulation is the aim, but publishers of technical journals foster circulation only among those readers who add to the value of their journal as an advertising medium.

Fundamentals are the same the world over, but practical problems vary with geographic location.

Over a territory as extensive as these United States are conditions varying between wide extremes.

National associations dealing with the practical side of the public utility business, for example, may be likened to those periodicals which have a large circulation representative of diversified interests. The utmost endeavor put forth does not cover the situation completely over every section, and recourse must be had to the geographic section which is now found to be most important and which may be likened to the technical journal with a specified purpose and specific circulation.

Effectiveness is secured only by specialization, which in turn necessitates localization or concentration of effort.

The national organization should deal only with those problems of interest to the entire industry, leaving to geopraphic sections the special problems of local importance.

The Northwest Electric Light and Power Association may be indicated as illustrating this principle, but there is also the necessity for a Southwestern Pacific Light and Power Association of a similar nature.

These associations, for the greatest effectiveness, should be branches of a Utilities Association of the Pacific Coast, thus permitting maximum authoritativeness, strength and expedition to any action of importance.

Such an association is advocated and such sectionalization of effort will always receive the support of this journal.

Scientific Management

Scientific management is the opportunity and haven of labor, the economizer of capital and the harmonizer of both. Better pay for more congenial work is the goal of labor and the most for its money the aim of capital. Scientific management supplies both these wants, and more.

If you would adopt scientific management and enjoy its progressive rewards, you must, as an employer, be prepared to pay high wages. This is at once the penalty and privilege of this practice; the penalty only because of a gain which seems loss until understood, the privilege because effective utilization is then assured in all departments—administrative, financial, producing and selling.

If you are an employee, you should realize that scientific management will require of you a greater output, but it will do this with a considerateness which will improve working conditions and shorten the hours of labor by increasing your effectiveness.

And because scientific management conserves, it makes possible the payment of more just wages.

And what is scientific management?

It is "a conservation which conserves." It does not depend upon complete but upon effective utilization; not upon how much you can get out of a workman, to state a case to point, but for how much of his best effort consistent with continued production is the employer so able to plan his work that he may be suitably rewarded.

To many it will prove astounding that scientific management calls for periods of rest; for instruction of employees; counsel; considerateness and the consequent seemingly superfluous expenditures.

But this is true, and it is in the need for these expenditures that the further value of scientific management is found for the electric, power and gas industries.

A study of scientific management opens new channels for the outpouring of your goods, as will educative effort always.

For in business no man can know of the better way and not tell another. Not to do this is to destroy the mainspring of present-day business, which is service.

You may show to the man of busy-ness unable to read these necessary signs as he runs the strenuous gauntlet of a management which does not manage, the gain of good lighting or improved machinery, the desirable effect upon his employees of more constantly renewed air and so forth.

These are a few of the reasons why the articles on Management, commencing in this issue, are included. They are of importance to you.

PERSONALS

ITEMS FOR THIS DEPARTMENT ARE SOLICITED FROM ALL READERS

Chas. W. Baker, district engineer Westinghouse Machine Company, is in Southern California.

W. R. Studenmund, Pacific Coast representative Gillinder & Sons, Inc., is at Vancouver, B. C.

J. I. Colwell, sales manager Seattle office Western Electric Company has returned to that city from a southern trip.

W. J. Taylor, of Pease, Bundy & Taylor, engineers and electrical contractors, Porterville, Cal., was a San Francisco visitor during the past week.

Ryotaro Mitsuda, electrical engineer to the Imperial department of communications, Tokyo, Japan, is a visitor at San Francisco.

H. C. Goldrick, manager Pacific Coast office Kellogg Switchboard & Supply Company, has returned to San Francisco from the Pacific Northwest.

Chas. B. Babcock, manager Pacific Coast office of the General Gas Light Company, San Francisco, has been elected a member of the Illuminating Engineering Society.

O. W. Lillard, Pacific Coast manager of the Gould Storage Battery Company has left San Francisco on a business trip to Salt Lake City and Denver and will return via the Pacific Northwest.

J. W. Bryant, who for some time past has been identified with the sale of Wagner apparatus in that territory, will have charge of the new office of the Wagner Electric Company at Syracuse, N. Y.

Chas. A. Walker, president of the White Pine Telephone Company, recently interested himself in the formation of a company to construct an interurban telephone line from Ely, Nevada, to Preston and Lund.

L. E. Sperry, manufacturers' representative, San Francisco, is now agent for American Circular Loom, vice **John R. Cole,** who has resigned to engage in the real estate and insurance business at San Francisco.

William Scott, superintendent of lines and electric service, Utah Light & Railway Company, was elected Grand Master of the Odd Fellows Lodge for the state of Utah at the last Grand Chapter held in Logan.

R. H. Sperling, until recently general manager and now a director of the British Columbia Electric Railway Company, Ltd., is at Vancouver, B. C., from London, England, and expects to remain in the West until the later part of July.

L. E. Hanchett, formerly interested in San Jose and Santa Clara electric railways, has been elected to the directorate of the Northern Electric Railroad and will be made chairman of the executive committee of the company.

H. B. Pierce, assistant commercial agent of the Washington Water Power Company, Spokane, Washington, spent a couple of days in Salt Lake City last week looking over the local situation. Mr. Pierce is on his way to the Philadelphia Convention of the N. E. L. A.

Charles L. Eshleman has resigned as general sales manager Adams-Bagnall Electric Company, Cleveland, Ohio, to become vice-president and general sales manager of the Union Metal Manufacturing Company, Canton, Ohio, which company is making arrangements to build a new factory, doubling its capacity.

Thurston Owens, one of the incorporators of the San Diego Gas & Electric Appliance Company, has been identified with the public utility business for the past 12 years, having been assistant superintendent Consolidated Gas Company of New York city, assistant engineer city of New York, associate editor American Gas Light Journal, and general manager La Crosse (Wis.) Gas & Electric Company. The Appliance Company bought out the San Diego Gas Appliance Company, took over the stock of the local gas and electric company, and are handling the lines of the General Electric Company and the Pacific States Electric Company in San Diego county.

H. F. Yost, secretary and treasurer of the Electric Stores Company, Inc., Sacramento, Cal., and Reno, Nev., was at San Francisco during the past week. Mr. Yost was previously with the Electric Appliance Company. **F. V. McAvoy,** who is president and general manager of this new company, was formerly the proprietor of the Reno Electric Works, which has been absorbed by the new company.

H. W. Burkhart, formerly with the Southern California Edison Company, was at San Francisco during the past week and among other matters attended to business in connection with his part of the Pacific Coast Gas Association Convention program. Mr. Burkhart announces that he has removed his offices to the International Bank Building, Los Angeles, where he will continue his consulting engineering practice in matters relaing to gas properties.

Tracy E. Bibbins, local manager San Francisco office General Electric Company, is in attendance at the National Electric Light Association Convention at Philadephia. Representing the Pacific Gas and Electric Company are **S. J. Lisberger,** engineer electrical distribution, and **F. H. Varney,** chief steam engineer, both of San Francisco. **John A. Britton,** vice-president and general manager of the Pacific Gas and Electric Company, and first vice-president of the N. E. L. A., was unable to attend on account of matters of importance in connection with the administration of his company. It is hoped that the San Francisco contingent, though small in numbers, will use sufficiently forcible arguments to bring the convention to San Francisco in 1915.

Jas. R. Petrie, manager of the electric light plant at Mazatlan, State of Sonola, Mexico, who is now at San Francisco, is able to tell a war story which at long-distance takes on a humorous turn. At Mazatlan the Federals (not those of the baseball war) had encircled the city with barbed wire, which the electric company was required to keep charged at high pressure. This proved in some way a barrier to the rebels, who tried, though for some time unsuccessfully, to get into touch with Mr. Petrie in order to convey to him the intelligence that he would be shot if the wires were not rendered harmless, by shutting down the plant. This information got to the Federal commander first, who indicated that if the plant were shut down the manager would be shot as a rebel. Mr. Petrie learned of his lodgment on these horns of a dilemma when the rebel leader ultimately got the message to him by means of a letter attached to a chicken (with feathers) which was dropped from an aeroplane. This, it is said, is the perfectly (h)armless "bomb" dropped in Mazatlan which was reported to have killed certain Americans and Britishers. Then Mr. Petrie found that Mexican patriotism consisted in stoning American citizens because of the taking of Vera Cruz and realizing that that either to run or not to run the plant resulted in shooting and the killing of a mortal coil which he would much prefer to remain charged, Mr. Petrie decided that to run himself and not the plant was the better part of valor. Having gathered a few valuables, this he did. Mr. Petrie has not decided just what he will do, but just as he finished this story a phonograph in the store across the way was heard singing, "And when he'll go back again nobody knows," or words to that effect.

MEETING NOTICES.

Seattle Engineers' Club.

The regular meeting was held after luncheon at the College Club on May 14th, when Glenville A. Collins gave an interesting talk on "Efficiency—Its Cause and Effect."

California Association of Electrical Contractors.

San Francisco Local No. 1 attended the Commonwealth Club as a body and heard the address by Will S. French of the Industrial Accident Board on "Safety First."

San Francisco Electrical Development and Jovian League.

The meeting held at the Hof Brau last Tuesday furnished an excellent paper in that delivered by T. E. Collins of the Westinghouse Electric & Manufacturing Company, on "Modern Merchandising and the Electrical Contractor," which was appreciated by all present. C. C. Hillis was chairman.

Oregon Electrical Contractors' Association.

The place of meeting for the second annual convention, June 8th and 9th has been changed to the Pittock Block, which offers more suitable facilities. There is no change in the program previously reported. The banquet and entertainment will be held at the Portland Hotel at 8:30 p. m. on June ninth.

Portland Electrical Contractors' Association.

At the last regular meeting of the Portland Electrical Contractors' Association the following officers were elected for the ensuing year: Robert. Skeen, president; J. H. Sroufe, vice-president; J. R. Tomlinson, treasurer; W. O. Fouchs, W. H. Smith, H. H. Fitzpatrick, B. J. Boicourt, and L. A. Walker, executive committee; and F. C. Green, secretary.

Seattle Bell Telephone Society.

The regular monthly meeting of the Bell Telephone Society was held at 8 p. m., Thursday, May 21st, in Eiler's Hall, third floor of the Eiler Building, Third avenue and University street, Seattle. The technical feature consisted of an interesting talk by District Traffic Chief J. W. Newell, whose subject was "Traffic." The entertainment committee furnished a good program.

Alameda County Electrical Development League.

The league met at a downtown Oakland cafe on May 23d, and enjoyed two papers, one by T. E. Collins of the Westinghouse Electric & Manufacturing Company, on "Modern Merchandizing by Electrical Contractors," and the other by M. H. Gregg of the Joint Pole Committee on "Present Problems of Distribution." This journal as the official organ of the league, was requested to publish these papers and they will appear at an early date. Wiring bids will be opened at the June meeting.

Los Angeles Section A. I. E. E.

The regular meeting was held on the evening of May 26th, at the University of Southern California. The subject of the evening was "Some Features of Teaching Electrical Engineering." Demonstrations of use of models and adjustable diagrams to illustrate certain principles of operation of electrical machinery were given by D. B. Munroe and E. L. Arnold, and a brief outline of courses and methods in use at U. S. C. will be given by A. W. Nye. Members present gave their views on what subjects may be taught to electrical engineering students with greatest profit.

Utah Light & Railway Company Section, N. E. L. A.

The regular monthly meeting of the Utah Light & Railway Company section of the N. E. L. A. was held at the company's new commercial office and electric shop at 154 Main street. Lloyd Garrison, in charge of the electric shop, gave a talk and demonstration of the various electrical appliances on exhibition there. At the conclusion of this demonstration an electrically cooked luncheon was served to the members under the direction of Mrs. Olive Huppert, the company's demonstrator. The meeting then adjourned to the Consolidated Music Hall where the regular meetings are held, and details for the section's summer outing at Pine Crest at the head of Emigration Canyon scheduled for June 13th were discussed.

Utah Electric Club.

The regular weekly luncheon of the Utah Electric Club was held at the Commercial Club Thursday, May 21st. The speaker of the day was Byron Cummings, Dean of the University of Utah, who told of the extensive explorations in southeastern Utah, principally in San Juan county, made under his direction by the University. The natural bridges to be found in this locality far exceed in magnitude and beauty those existing at any other known locality in the world, the largest having a span of 345 ft., and an arch 241 ft. in height. The University exploration parties were able to find in some of these remote and almost inaccessible canyons the remains of large villages of cliff dwellers which had not been previously visited by white men. They were thus able to secure some of the most interesting relics of the cliff dwellers available in this country.

Utah Eleciric Club Outing.

The first summer outing of the Utah Electric Club was held at Lehi, Saturday, May 16th, the trip of thirty miles being made over the new Orem interurban electric line. A special train, in two sections, left at 1:30 in the afternoon and two hundred and fifty members of the club participated in the enjoyable outing, elaborate preparations for which had been made by the entertainment committee. The local electrical jobbers, retailers, contractors and central station companies closed their establishments at noon so that their employes could take part. A closely contested game of baseball between a picked team of the Electric Club and the Lehi team of the Utah County League, which won the championship last year, was won by the Lehi team—score six to five. After the game a picnic banquet was served to the members by the ladies of the Lehi Commercial Club, and in the evening a ball was enjoyed by the excursionists in Lehi's new dancing pavilion. The entertainment committee, which had charge of the affair, consisted of L. E. Brown, chairman; J. V. Buckle, Bruce S. Cramer, J. G. Guiver and Julius F. Derge.

San Diego High Potential Blow Out.

The electrical interests of San Diego had a real old fashioned blow out Saturday, May 23d, at the well known amusement park, "Wonderland," at Ocean Beach near the city. After a number of successful weekly luncheons it was decided to hold an outing and the committee made it a "blow-out."

Promptly at 12:30 p. m. the parade of some 25 autos left the plaza with the members and their friends and then whizzed to the beach where a buffet luncheon was served. From that moment until the lights were out everyone was on the jump or the hop-skip-and-jump, or in the tug-of-war or the 50 yd. dash or the cracker eating contest or the ball game, etc., ad lib.

There were almost as many prizes as there were contestants and there were many more contests than those named. The most important event was the shot put, which was won by Mr. Hartwell, the dean of the electrical industry in the city, but it was discovered that the shot he used was made of Aluminum instead of iron.

Promptly at 6 dinner was served to the 175 who were present at the Casino and then more talent was discovered as those called upon proved to be real entertainers instead of after-dinner speakers.

The success of the affair was mainly due to the efforts of Chairman Howell and Messrs. Nightingale, Crist, Holloway and Mayer.

The sentiment of those present was well expressed in the chorus of a song written for the occasion by Mr, Nightingale:

High Potential Men—We are on a blow-out
Fuse it up again—It will make you shout,
Here we are together—Good time for all,
And we'll have another blow-out some time next fall.

Picnic of General Electric and Pacific States Electric Companies.

Contrary to the weather prognostications of Hop Sing and Wilson Saturday, May 23d, was rainless at Idlewood Park, Niles Canyon, which was the scene of the second annual picnic of the San Francisco offices of the General Electric Company and the Pacific States Electric Company. Here a crowd of nearly five hundred employes and their families spent a happy day, not even an office boy being left to answer the telephone in the city offices.

A special Western Pacific train took the crowd and a brass band to the scene of the festivities. After the lunches had been cached the first business of the day was a tug-of-war between the strong men of the two companies, the General Electric winning the match. Then in quick succession followed various races and athletic contests. The boys competed in a hundred yard dash, hop-skip-and-jump, a three-legged race and a pie-eating contest. The ladies tried their skill at baseball throwing, a potato race, knife and bean contest and wood-sawing. Handsome prizes were awarded the winners and much amusement afforded the spectators.

Dancing was the order of the afternoon, interrupted only by the trial of one W. L. Goodwin, who was adjudged guilty of attending certain games of baseball during office hours. The jury consisted largely of ladies, which fact, together with his attempted break for liberty, is largely responsible for the verdict.

Finally at five o'clock the train was ready to take the joyous crowd home. All present voted the occasion most pleasurable and conducive to a friendly spirit of co-operation, thus making future picnics of the same kind quite probable.

The various valuable prizes were won by the following:

Gate Prizes—A. G. Jones (G. E.), suit case; H. Cooper (G. E.), camera.
Hand Ball Throwing—Mrs. T. E. Bibbins (G. E.), three pair silk stockings.
Knife and Bean Race—Miss U. Bibbins (G. E.), hand bag.
Wood Sawing Contest—Mrs. Lewis (G. E. guest), corsage bouquet.
Potato Race—Miss V. Peirce (P. S. E.), hand painted powder jar.
Tug-of-War—General Electric Company, cup.
100 Yard Dash—Percy Goodwin (P. S. E. Co.), watch fob.
Hop-Skip-and-Jump—H. E. Peets (G. E.), fountain pen.
Three-Legged Race—F. Mulvany and L. Van Atta (P. S. E.), two tie clasps.
Pie Eating Contest—Charles Goodwin (P. S. E.), baseball shoes.
Childrens' Games (hand ball throwing, under 12 years)—Carl Corcoran, skates; under 7 years. Frank McNeales, push

The Jovian Electrical League of Southern California.

The weekly luncheon at Christopher's on May 20th was attended by about 100 Jovians and was presided over by James Irvine. A splendid musical offering was rendered by the Kraum Trio from the Victoria theater, New York. An interesting lecture, illustrated by many beautiful and instructive lantern slides, was delivered by Prof. Cyrus A. Clark, a missionary who has been living and working in Japan for the past 27 years. He not only described the home life and customs of the Japanese, but portrayed by means of slides the various operations incident to the rice, tea and silk industries. The following letter and resolution, which is self explanatory, was unanimously adopted:

City Council, Los Angeles, Cal.:

Our league, which is composed of a majority of the electrical engineers, contractors, dealers, central stations, manufacturers and wholesalers of Southern California, has watched with great interest the progress and lack of progress in the fire alarm situation in this city. From time to time efforts have been made to afford the city much needed relief from the dangerous conditions in whch we are placed owing to the inadequate system with which our fire department is now hampered. We understand that specifications were prepared and approved by a former city council, so that the best system might be selected, looking towards open competitive bidding and demonstration of all apparatus.

At a meeting of the league today, the enclosed resolution was duly passed and the secretary instructed to send this communication, together with a copy of the resolution to your honorable body, in the hope that, by proffering our services, free of expense, we might, as citizens, demonstrate our keen desire to help.

If our efforts can be used to advantage we would gladly appoint a committee to act in the city's behalf as suggested in the resolution.

JOVIAN ELECTRICAL LEAGUE OF SOUTHERN CALIFORNIA.
(Signed) K. E. Van Kuran, Secretary.

Copy of resolution adopted by the Jovian Electrical League of Southern California at its meeting held in the city of Los Angeles, May 13, 1914:

Whereas, The Jovian Electrical League of Southern California has taken a lively interest in the action and discussions of the council relative to the construction of a fire alarm system in our city, which is stated as probably involving an expenditure of a quarter of a million dollars, and

Whereas, It is the opinion of this league, that the only safe method for the city to enter upon such a great outlay as that contemplated, is to secure competitive bidding from all manufacturers with complete demonstration of apparatus and instruments, and

Whereas, Specifications have already been approved by the city council looking towards open competitive bidding that will not favor any particular manufacturer.

Now, Therefore, Be It Resolved, That this league proffer its services without expense to the city in examining the aforementioned specifications, to approve or disapprove said specifications, and if disapproved, to furnish the city with complete specifications which will be ideal in that all manufacturers of fire alarm apparatus or instruments can bid competitively, and

Further, Be It Resolved, That said specifications will not favor any manufacturer of instruments or apparatus or any particular type of construction or material, but will be based solely on results and service, requiring open demonstration.

J. N. COLLKITT, Chairman.

Attested by K. E. VAN KURAN, Secretary.

The rejuvenation prize winners were announced by Chairman Collkitt and many guests were introduced.

INTERNATIONAL ENGINEERING CONGRESS, 1915.

Among the general subjects to be treated before the International Engineering Congress, 1915, probably the one having the broadest interest is that of Materials of Engineering Construction, which enters into all phases of engineering activity.

The list of topics which will be treated in this section is as follows:

(1) Timber.
(2) Preservative Treatment of Timber.
(3) Substitutes for Timber in Engineering Construction.
(4) Brick in Engineering Structures.
(5) Clay Products in Engineering Structures.
(6) Probable and Presumptive Life of Concrete Structures made from Modern Cements.
(7) Aggregates for Concrete.
(8) Slag Cement.
(9) Waterproof Concrete.
(10) Cements containing Additions of Finely Ground Foreign Material.
(11) Economics of the World's Supply of Iron.
(12) The Life of Iron and Steel Structures.
(13) The Employment of Special Steel in Engineering Construction.
(14) The Place of Copper in the Present Engineering Field, and the Economics of the World's Supply Thereof.
(15) Alloys and Their Use in Engineering Construction.
(16) Aluminum in Engineering Construction.
(17) The Influence of the Testing of Materials upon Advances in the Designing of Engineering Structures and Machines.
(18) Cement Testing.
(19) Testing of Metals.
(20) Testing Full-Sized Members.
(21) Proof Testing of Structures.

The papers to be presented from the United States have already been arranged for from the recognized leading authorities on the various topics. Arrangements for the papers from foreign authors are being rapidly concluded, and the aggregation of papers which will be presented will constitute a broad review of the field and be of the highest value.

Marked interest in the congress from foreign countries continues, and there is every evidence that the attendance from abroad will be large. It is hoped that all engineers in this country who have not yet subscribed as members of the congress will give the matter their immediate attention and favorable action.

Full information concerning the congress, the price of subscription, and the arrangement for purchase of volumes of the proceedings, may be obtained by addressing the Committee of Management, Foxcroft Building, San Francisco.

ERRATA.

Busch-Sulzer Bros.-Diesel Engine Company has directed our attention to an error in our report on p. 448 of the last issue made in connection with the installation of their Diesel engine exhibit at the P. P. I. E., in which it is stated that the Diesel Engine Company is the only manufacturer of these engines in the United States. This should have read the oldest established manufacturer or the only manufacturer in the United States building Diesel engines exclusively.

The information given in our last issue under "Transmission," p. 462 regarding the new transbay submarine cable of the Great Western Power Company is incorrect as the contract is being carried out by A. J. Pahl, K. P. F. Electric Company, San Francisco, as stated in our issue of April 18, 1914. The old cable is to remain in service.

TRADE NOTES.

Central Electric Company has removed to the new Crossley Building, San Francisco, from their former location on Stevenson street.

Fairbanks-Morse were low bidders on a contract for furnishing the city of Seattle with a pump and electric motor for the sum of $1650.

The Technical Book Shop will now be found at the new Crossley Building, corner New Montgomery and Mission s'reets, San Francisco.

The Wagner Electric Manufacturing Company, St. Louis, announces the opening of a sales office at 524 University Block, Syracuse, New York.

The offices of the Technical Publishing Company have been removed from the Rialto Building to the new Crossley Building, corner New Montgomery and Mission streets, San Francisco.

The Crocker-Wheeler Company, electrical engineers and manufacturers, are removing from the First National Bank Building, to the new Crossley Building, corner New Montgomery and Mission streets, San Francisco.

The Allis-Chalmers Manufacturing Company has secured an order for the complete equipment of an electrically driven redwood sawmill, from the E. B. Salsig Lumber Company, of Gualala, Mendocino County, Cal. The order includes an 800 kw. turbine, motors aggregating 1600 h.p. and the necessary sawmill machinery.

The Kellogg Switchboard & Supply Company has closed a contract with the Farmers Mutual Telephone Company for a complete telephone exchange system for Blaine, Washington. The installation will include the latest type of common battery development with eight party harmonic selective ringing apparatus. When completed, the plant will be the most modern in the state of Washington.

Removing iron particles from ground scrap rubber in the reclamation plant of a rubber mill and extracting the metallic iron from crushed slag in the steel plant are two new applications of Cutler-Hammer magnetic separators that have recently been made. The separating is effected on a belt over the magnetized pulley which picks out the metallic particles and allows the balance to be cast forward to a conveyor or chute.

J. D. Ross, superintendent of the city lighting department, Seattle, Wash., announces the arrival of the principal machinery for the new auxiliary steam plant now under construction. The machinery, being furnished by Chas C. Moore & Company, Engineers, and now in the yards of the Milwaukee railroad, consists of 3000 h.p. Stirling water tube boilers, making eight carloads, also four carloads of condensing apparatus made by the Wheeler Condenser & Engineering Company, and heaters and pumps from the Platt Iron Works.

LIST OF APPROVED FITTINGS REVISED.

Advance copies of April, 1914, List of Approved Electrical Fittings are to hand and attention is directed to the following: Two new subject headings have been added, reading "Soldering Flux" and "Lightning Rods." Explanatory notes have been inserted under sockets and receptacles. A receptacle is defined as a lamp holding device designed to be attached to a flat surface or within a box by means of screws or by a clamping ring. A socket is a lamp holding device designed to be fastened to a threaded pipe (as on fixtures) or on supply wires, as a pendant. Sockets and receptacles are in general grouped under Key, Keyless and Pull. A distinction has been made between auto starters which disconnect all lines when in the off position and those which do not. Aside from the above the only changes consist in the usual additions, omissions and corrections necessary to bring the list up to date since the last issue.

CALIFORNIA ASSOCIATION OF ELECTRICAL INSPECTORS

Section of N. A. E. I.

C. W. Mitchell, President. Arthur Kempston.
Wm. G. Pennycook, Vice-Pres. B. C. Hill, Executive Comm.
John W. Carrell Secretary-Treasurer, 55 Fulton, San Francisco

The purpose of this organization is to standardize the common practice in electrical construction with the National Code as the general standard.

Questions pertaining to electrical construction will be answered in these columns, but only from the point of view of the Code. This is a voluntary organization and the answers published under this heading must not be construed as authoritative, or binding. No attempt will be made to correllate the answer from the several Inspection Districts, as an occasional difference of opinion will tend to induce further study on subjects. All questions will be passed upon by an executive committee.

Address all communications to the secretary.

By the Secretary.

WIRING AND EQUIPMENT OF METER LOCATIONS.

[Concluded.]

The best known methods of equipping meter locations are: the accessible wire-way system, Fig. 1 (fully described in the issue of May 23, 1914); to place all the wiring, switches and cutouts in a metal cabinet and to arrange

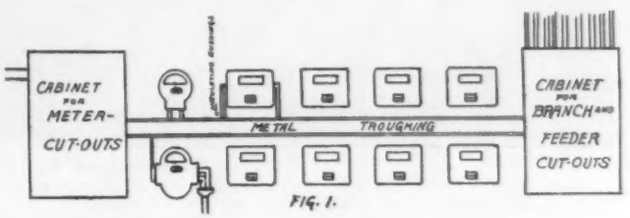


FIG. 1.

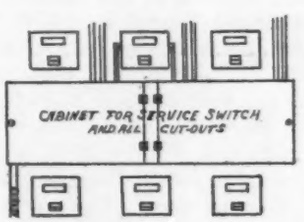


FIG. 2.

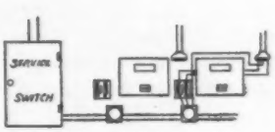


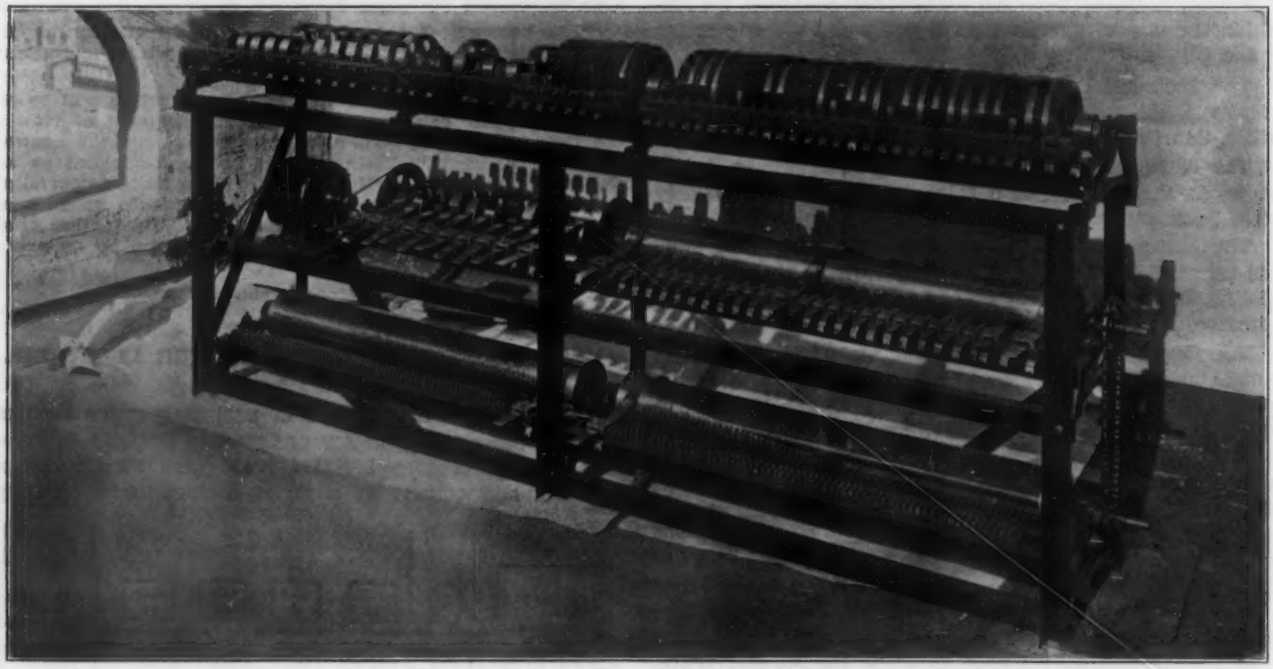
FIG. 3.

the meter loops as shown in Fig. 2; to run a feeder circuit along the meter board and to tap a loop and mount a cutout at each meter, in conduit as shown in Fig. 3, or to run the wires under the rules for open work; to place all equipment, including meters, in an approved cabinet, or to mount the meters on a switchboard of slate or marble.

Where the meters are grouped in a place at or near one of the principal entrances of the building or in a place which is easily accessible from the street, the ideal location for the main service switch is presented. It may be well to digress enough to point out that the measuring of the term "readily accessible" when applied to the service cutout is somewhat different than when applied to the main switch; the purpose of the first being to have as little unprotected wire within the building as practicable and that of the second being to cut off the entire current at a place which can be quickly and easily reached.

One of the principal difficulties met with in meter wiring presents itself when wires of different systems are brought into the same meter-locations, principally a.c. and d.c. services. Architects and engineers could modify this trouble by specifying that, **"Each feeder circuit which leaves the meter location must be in a separate metallic armor, nor shall one metallic armor contain branch circuits which exclusively supply separate apartments or other sections of a building which are so arranged that the supply may be measured by a separate meter."**

INDUSTRIAL



General View of "Ben Hur" Sign Flasher.

A LOS ANGELES ELECTRIC SIGN FLASHER.

One of the electric sky sign features at Los Angeles is that advertising Ben Hur Coffee, and located on the O. T. Johnson Building, corner Fourth and Broadway. The flasher, which is illustrated herewith, is 7 ft. long by 4 ft. high, and consists of 208 contacts, making and breaking over 2500 times per min., and carrying over 750 amp. The sign operated by this flasher consists of a face 12 ft. high of Mr. Coff. E. Bean, who is holding a cup over his head, the steam rising from the cup forming the words "Coff. E. Bean says." The wording "Ben Hur, Steel Cut, Coffee" is flashed on in three divisions, followed by the word "Satisfies," which writes out in script and finishes with a big flourish underneath, ending at a big coffee pot which is then flashed on. During these operations the face is continually changing, having six facial expressions, and a further eight of the eyes. The sign goes dark for an instant, and then the wording "Ben Hur Steel Cut Coffee Satisfies" flashes on as a whole. Then all the lights go out, and this cycle of operation is repeated.

The flasher was designed and built by the Brown Flasher & Manufacturing Company, Los Angeles, Cal., and delivered by them to the Greenwood Advertising Company (Western) in twelve days from the time the order was received. The Brown Flasher Manufacturing Company handle all this class of business for the Greenwood concern, and all of their machines are built of material purchased in California.

DISC-STOVE CHAFING DISH SET.

A novel arrangement of a combination disc stove and chafing dish has been recently placed on the market. The set is similar to the ordinary alcohol type chafing dish except that it has an electric disc stove, in direct contact with the water pan, instead of an alcohol heater. The complete set consists of a stand, a disc stove, cord, three-heat switch, and attachment plug, a water pan, a food pan, and a cover, as illustrated.

All metal parts, except the top of the disc stove, are handsomely finished in polished nickel or polished copper. The handles are ebonized wood.

The heater of the disc stove consists of a steel disc inside of which the heating element is sealed and protected from oxidization. A dead-air space between the heater and the bottom of the stove casing acts as a heat insulator, preventing the loss of heat downwards, so that practically all of the heat is utilized, thus resulting in an efficient appliance.

Parts of the Type C Disc-Stove Chafing Dish Set.

With the feet of the disc stove reversed so that the stove can be suspended from the stand and with the parts assembled as shown the outfit is a chafing dish, capable of cooking anything in it that can be cooked in a chafing dish.

Chafing Dish Set Complete.

With the feet inserted in the stove the disc stove can be used separately, for any purpose that gas stove burners are used for, such as frying, grilling, making coffee, and similar operations.

The disc-stove chafing dish set is manufactured by the Westinghouse Electric & Manufacturing Company, East Pittsburg, Pa.

NEWS NOTES

INCORPORATIONS.

CLIFTON, ARIZ.—The Morenci Water Company has filed articles of amendment of incorporation, increasing capital stock of the company from $500,000 to $600,000. M. H. McLean is vice-president and H S. Van Gorder, secretary.

BRIGHAM CITY, UTAH.—The Brigham Electric Company, a newly organized corporation with several Salt Lake electrical men as the principal holders of the stock have taken over the interests of the Flynn Electric Company. The officers of the new corporation are as follows: R. W. Nicol, president, Salt Lake City; Francis Pitt, vice-president and treasurer, Brigham City; W. D. Cummings, R. S. Folland, L. A. Herdtle, directors.

ILLUMINATION.

HUNTINGTON PARK, CAL.—The city trustees have purchased 96 cast iron posts from the Madson Iron Works, for $1487.50.

LEVENWORTH, WASH.—The Cashmere Electric & Water Company has applied for a franchise for furnishing power and light.

SAN MATEO, CAL.—The chamber of commerce has inaugurated proceedings for an electrolier system of lighting for the business district.

EL PASO, TEXAS.—Sealed bids will be received up to June 15th, for the construction of an addition to the electric lighting system at Fort Bliss, Texas.

GLENDALE, CAL.—An ordinance has been adopted authorizing the issuance of $4000 in bonds for the purpose of enlarging the municipal electric light and power plant.

WINSLOW, ARIZ.—An election will be held here June 5th, to vote on an ordinance to grant to C. M. Lang and H. P. Pattillo right to manufacture gas for heating and other purposes.

NORTH YAKIMA, WASH.—The directors of the Central Heating Company have applied to the city for a franchise for furnishing light and power in addition to heating, the cost of the proposed plant to be $100,000.

LOS ANGELES, CAL.—The city council has adopted an ordinance ordering the necessary appliances to be installed in Hollywood boulevard between Cahuenga and Wilcox avenues for lighting the street with electric lights.

SIERRA MADRE, CAL.—Plans for the proposed ornamental lighting system for Baldwin avenue have been presented to the city trustees by Engineer Bixby. They call for a single standard of copper covered steel or concrete surmounted by a single globe.

KAMLOOPS, B. C.—Tenders are called for the construction of a reinforced concrete power house to be built for the Barriere River hydroelectric development for the city of Kamloops. Messrs. Ducane, Dutcher & Company, Vancouver, are consulting engineers.

NAPA, CAL.—An ordinance has been passed by the board of supervisors granting to the Calistoga Electric Company a franchise to erect along certain streets in Napa county, wires, cables, etc., for the purpose of transmitting electricity for light, power and heat.

SALT LAKE CITY, UTAH.—The Utah State Capital Commission is advertising for bids for the electric lighting fixtures for the new state capitol. Bids must be received not later than June 5, 1914. Plans and specifications may be secured at the office of Richard Kletting, Architect, 415 Felt Building, Salt Lake City.

TRANSMISSION.

LANCASTER, CAL.—G. B. McLean, Pacific Light & Power Corporation representative, together with directors of the company, visited here recently investigating conditions relative to the proposed project of extending an electric power line into this territory.

MOUNT PLEASANT, UTAH.—The Big Spring Electric Company at Fountain Green have been experimenting with an electric pumping outfit on the place of Warren Holman in the southern part of the city. A flow of 480 gal. is easily obtained from a 33 ft. well using a 5 h.p motor. This flow is equivalent to about 2-3 of the regular irrigating stream. The cost of the well and pumping plant amounts to about $1200. The results secured have been so satisfactory that it is quite likely that several other plants will be installed in this vicinity.

BOISE, IDAHO.—Judge F. S. Deitrich has declared void the contract between the Idaho-Oregon Light & Power Company and Boise City, Idaho, under which the former was to furnish service for the new street lighting system at a rate of $11.24 per light per year. This contract was made under severe competitive conditions prior to the appointment of a receiver for the Idaho-Oregon Company. The receiver objected to complying with the conditions of the contract on the ground that to continue to furnish the service at his price would result in a loss to the creditors of the company.

SAN FRANCISCO, CAL.—N. W. Halsey & Company, fiscal agents of the San Joaquin Light & Power Company announce that a special meeting of stockholders will be held June 11 for the purpose of authorizing an amendment to the articles of incorporation by changing the $3,500,000 of unissued preferred stock into 6 per cent cumulative prior preferred stock, which will have preference over the existing preferred and common stock. The board of directors have also called a special meeting of the stockholders to be held on June 29 for the purpose of authorizing the issuance of $2,000,000 bonds or debentures, in case prior preferred stock either is not authorized or fails to find a ready market at a satisfactory price.

LAKEPORT, CAL.—The dredge which has been under construction by the Stockton Iron Works for the Yolo Water & Power Company here the past six weeks, was launched in Clear Lake a few days ago. The barge is 80 ft. in length, and the dredge will be a combined clamshell and suction type, also equipped with pile driver. The 150 h.p. gasoline engine, and other machinery, will be installed immediately. The Yolo company expects to start work on the Lakeport Lake front fill with the dredge. This is a project to dike and fill in the town's frontage on Clear Lake for a distance of 1800 ft., creating much new land, new streets and a park site. Two railroad companies have terminal sites in Lakeport. The Yolo company and individual property owners are co-operating in the fill.

SACRAMENTO, CAL.—A petition for a writ of review designed to test the constitutionality of the act under which the State Industrial Accident Commission was created, has been filed in the Supreme Court by the Great Western Power Company. The action is based on an appeal from the judgment of the commission in awarding damages to the widow of James W. Mayfield, who was killed at Sacramento in October, 1913, while cutting a live wire of the power company's lines without rubber gloves, which his foreman had ordered him to wear. The writ of review is asked for the purpose of having the Supreme Court determine the law-

fulness of an award made to Mayfield by the State Industrial Accident Commission, the lawfulness of the proceedings in which the said award was given and also the lawfulness of an order by the accident commission denying the power company a rehearing in the matter of the award

TRANSPORTATION.

SEATTLE, WASH.—The city council of Seattle has passed an ordinance authorizing the purchase of freight equipment for the Lake Burien municipal electric line.

OAKLAND, CAL.—Resolutions protesting against the proposed new Key Route line which would cut through the Mills College campus were adopted at the annual meeting of the Mills College Club.

RAYMOND, WASH.—The county commissioners have set June 2 as the day for hearing the application of Frank McMean for a franchise for a system of electric railways on all the public highways in Pacific county.

OAKLAND, CAL.—The board upon the recommendation of the roads, bridge and franchise committee, has granted to the San Francisco-Oakland Terminal Railways, a franchise in San Lorenzo, along Telegraph road to the station in that town.

SEATTLE, WASH.—The city council has decided in favor of granting the Puget Sound Traction, Light & Power Company a franchise to extend several Seattle street car lines on the basis of the original franchise and it is expected that the system will be immediately enlarged by this recent concession.

SAN FRANCISCO, CAL.—The board of works has authorized the advertising for bids for the construction of the Stockton street railroad. Bids will be received up to June 1st. In this contract it is proposed to build the road through the Stockton street tunnel and along Columbus avenue to North Point street and thence to Van Ness avenue.

OAKLAND, CAL.—Specifications for the two new steel propeller ferryboats to be built for the San Francisco-Oakland Terminal Railways (Key Route system), in time for the exposition traffic, have been mailed to four shipbuilders about the bay, and bids must be offered by June 1st. It is thought that the boats will cost about $200,000 each.

SEATTLE, WASH.—The first municipal cars of the city of Seattle are now being operated over division A, which extends from Thirteenth avenue West and Nickerson street on the south shore of Salmon Bay to Third avenue and Pine street, a distance of about 4 miles. Division A represents an investment by the city of $379,414 from a bond issue of $800,000 authorized by the voters in 1911. The line is equipped with twelve steel cars of the latest improved construction.

FRESNO, CAL.—An ordinance has been adopted by the board of supervisors granting a franchise to the Fresno Interurban Railway Company to construct an interurban railway along a portion of Fresno avenue. The tearing up of Fresno avenue preparatory to laying the rails along the thoroughfare for the railway is progressing rapidly. Through the Esmeralda vineyard for more than a mile the ties have been laid and over a large part of this stretch the rails are down. J. B. Rogers has promised to have the road in operation by the first of July.

STOCKTON, CAL.—There are persistent rumors that the city lines of the Central California Traction Company are soon to be taken over by the Stockton Electric Railroad Company. The city officials are still pressing the traction company to repair its right of way according to the terms of its franchises. To properly repair those portions of Stockton's streets covered by its franchises would, it is reported, cost the traction company in the neighborhood of $75,000. The company has always pleaded lack of funds whenever the officials have pressed the railroad to live up to its franchise. Monday evening, it is rumored, the principal owners of the traction company held a conference with Paul Shoup. It is reported that the terms of the sale was agreed on at last meeting. A few weeks ago Paul Shoup visited Stockton and inspected the city lines of the traction company.

AUSTIN, TEX.—What promises to be the first of several interurban railways that will be built by the Southern Pacific in its Galveston-Houston territory is soon to be constructed from a point near La Porte to Seabrook, about 14 miles. The proposed line will run along the bay shore where there are many resort homes. It is said that it is planned by the Southern Pacific to enter the interurban field of Houston and Galveston in much the same manner as was done at Los Angeles and Oakland. Whether the trains will be operated by electricity or gasoline motor is not stated. The suburban districts of the two sister coast cities are growing rapidly, and while the electric interurban line that is already in operation between the two points takes care of a large local traffic there is quite a large population situated away from that particular route which is said to be in need of rapid transit facilities

TELEPHONE AND TELEGRAPH.

HOLTVILLE, CAL.—The Valley Telephone Company has applied to the city trustees for a franchise for an exchange in that city.

POCATELLO, IDAHO.—The boards of commissioners has granted a franchise to the Smith Telephone Company to construct and operate a line in Gentile valley.

NAMPA, IDAHO.—An ordinance has been presented by Lone Tree farmers asking for permission to erect a pole line in the city and put in a telephone exchange.

DUNCAN, ARIZ.—J. E. Allen, owner of the telephone system in Lordsburg, has purchased a half interest in the Duncan exchange from James V. Parks, and will become manager of the Duncan system. Substantial improvements in the system are promised.

SPOKANE, WASH.—The Pacific Telephone & Telegraph Company will be obliged to operate without a franchise in Spokane for a period of nearly two months, even if the city council grants the corporation a new franchise at the earliest possible time. The present franchise of the Pacific company expires on June 17th. The proposed new franchise has been published only two weeks and must be published two weeks more, according to the charter, before it can come before the council for the first, second and third readings. During this stage at least 30 days must expire, and in the event of its passage by the council at the end of this 30 day period an additional month must expire before it may take effect.

WATERWORKS

FRIDAY HARBOR, WASH.—This city has authorized a bond issue of $14,000, which has been bought by John E. Price & Company. With the proceeds will be built a gravity water system.

RIVERBANK, CAL.—R. W. Hobart, president of the Riverbank Land & Water Company has completed plans to install a water system in that town.

LOS ANGELES, CAL.—The board of supervisors will receive bids up to June 15th, for a franchise granting right to construct and maintain water pipes in certain portions of Los Angeles county, commencing at the intersection of the Los Angeles-Santa Ana county road with Russell street in East Whittier, and extending in eastern direction along Russell street, to Los Angeles and Orange county line. The Franchise is to extend for a period of 40 years.